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JANUARY 1956

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Grinding and Finishing

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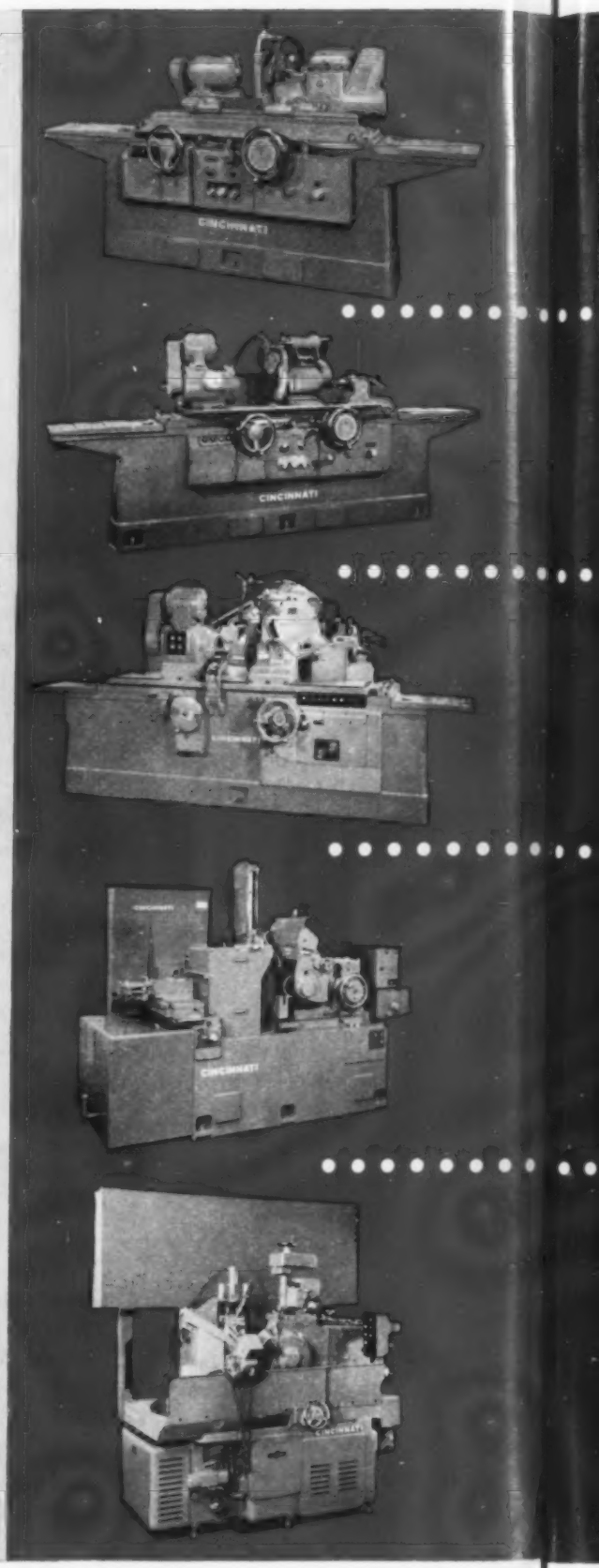
Precision Preview

for Precision Production in '56



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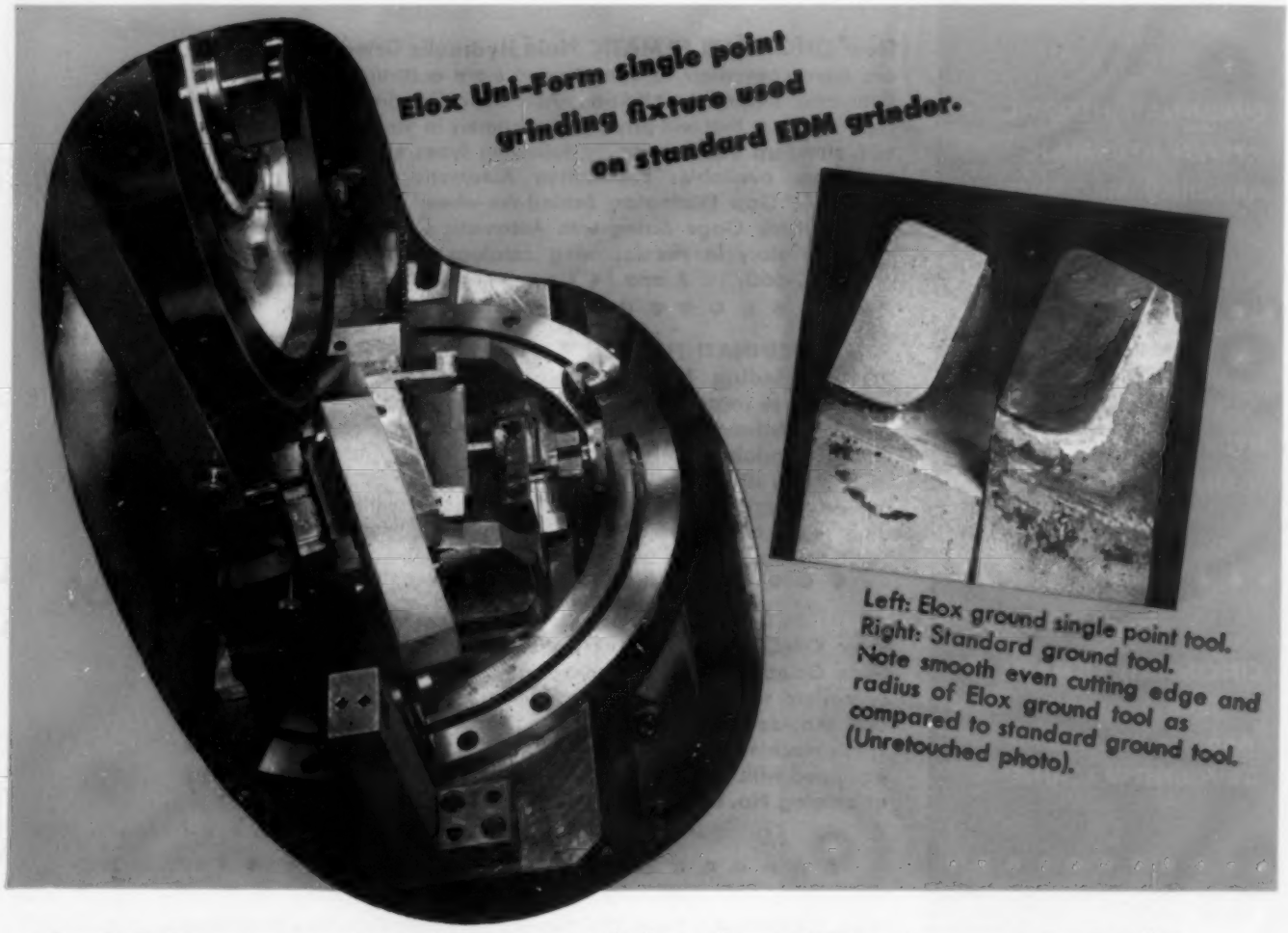
Elox Uni-Form single point
grinding fixture used
on standard EDM grinder.
Left: Elox ground single point tool.
Right: Standard ground tool.
Note smooth even cutting edge and
radius of Elox ground tool as
compared to standard ground tool.
(Unretouched photo).

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See Elox Uni-Form Single Point Tool Fixture in operation at Elox Demonstration Centers.

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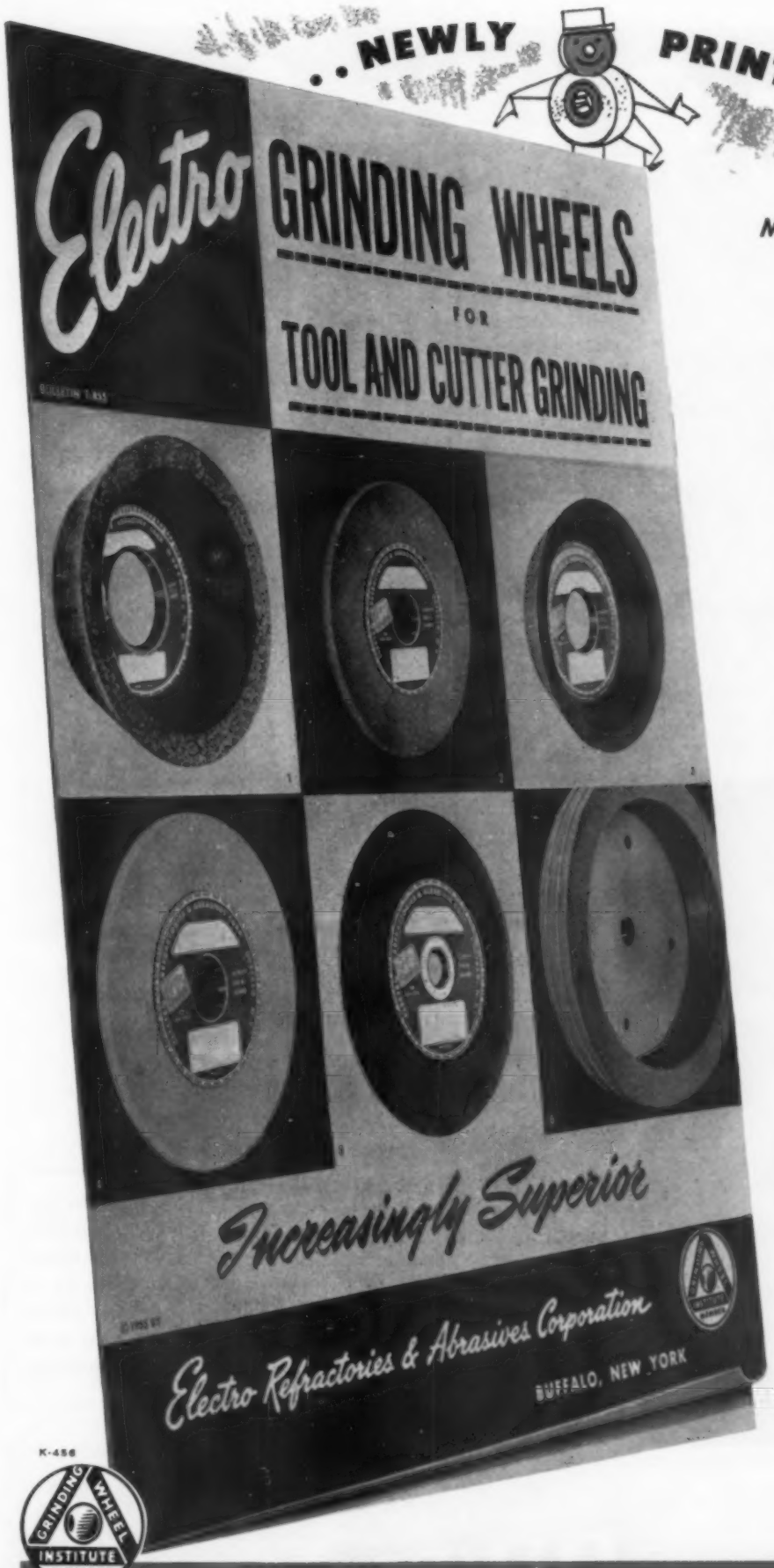

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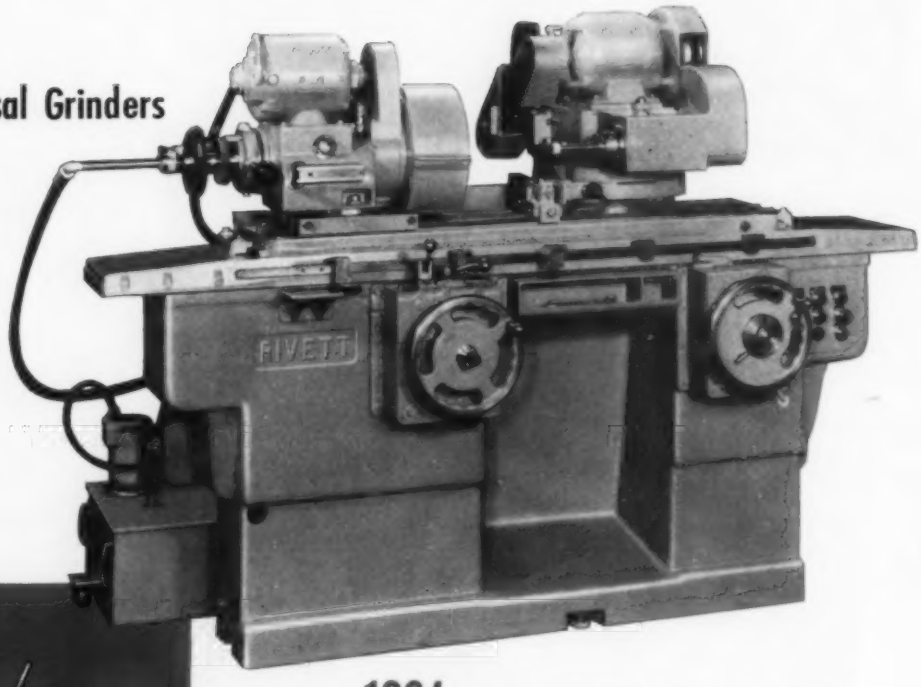

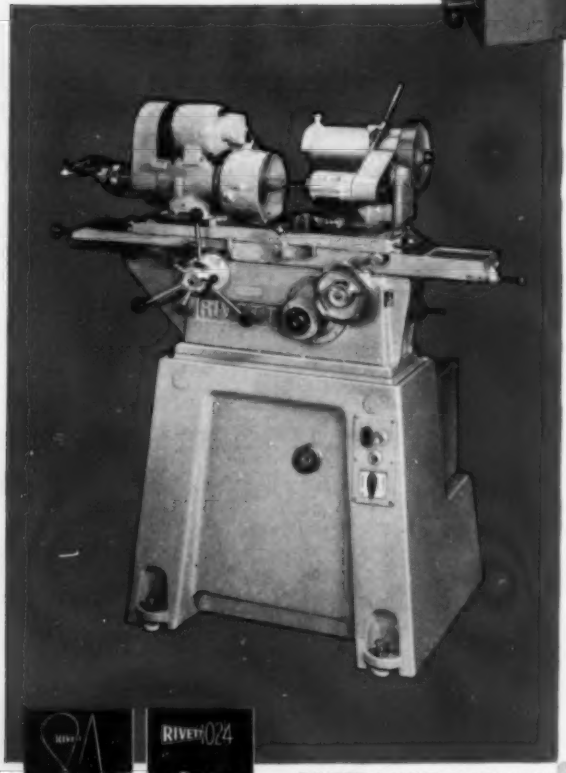

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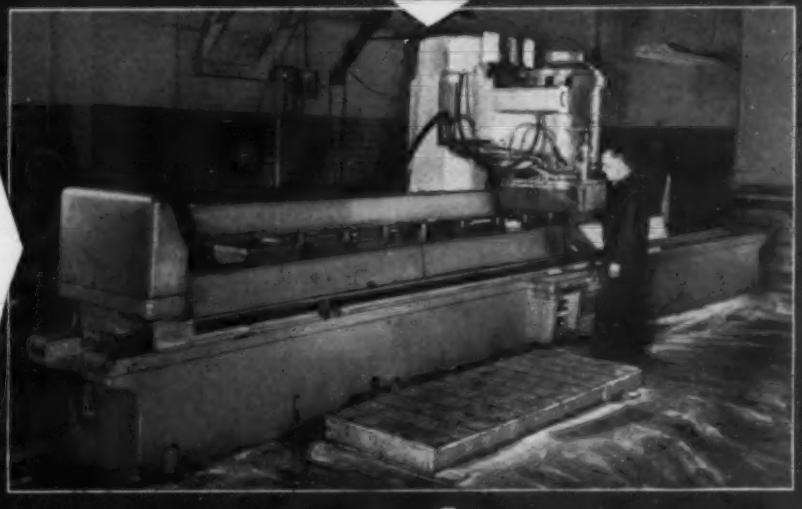

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The Editor's Page

Doing Well, Thank You!

Have we not all, at one time or another, puffed out our vests and smugly announced that all's well, there are no problems? This is good. Most of us are beset by questions, always, and if we don't take a breather now and again, and declare a cease-fire with our problems we'd all develop ulcers the size of pumpkins—and that's big for ulcers!

The majority of us, with time, luck and the kind help of experts, friends, colleagues and an occasional hanger-on, manage to solve our difficulties; then boldly face up to the next, muttering something about there being an easier way of making a living.

But there are those who have no problems, they're doing well, thank you.

To begin with, every production man always has two basic problems: how to cut costs and how to improve quality. Let us ignore these two basic difficulties for the time being and make a bold statement: too many people don't know they have problems and will not go looking for them. This is dangerous. No improvement or progress can be made unless there is a difficult situation to overcome. Ours is a continual fight with the powers of darkness for every inch of progress. The man without problems is losing by default!

We must look for ways of increasing production, of cutting costs, of improving quality. We must hunt out troubles and problems and nasty questions. We must look for weak spots. The golden gate is not reached through wishful thinking—we are not automatically dumped unto the lap of peace. We must look for trouble . . . seek out the problems. Make some if need be, but let's have problems.

The more problems we have the more we complain. And this, too, is good. A hard-working griper, slugging it out is of greater asset to a company than the chappie who's doing well. It is better to say, with all my problems I'm doing well, thank you. For then you will enjoy the luxury and softness of the Elysian Fields, that much sought-after land where ulcers and worry disappear and peace reigns supreme.

Wm. J. Schleicher

Editor

CENTERLESS Grinding

Part 3. Machines, Attachments, Blades Set-ups

Prepared by the Editorial Staff of Grinding and Finishing

ALL centerless grinding machines operate on the same basic principle of centerless grinding—utilizing work blades, a regulating wheel and a grinding wheel which between them provide a full floating condition to the work piece. We shall not attempt in this article to give complete descriptions of any of the various models available in this country, for that is not necessary to an understanding of how they operate, nor shall we attempt to evaluate their respective merits. All of them are doing satisfactory work of the sort for which they are designed in American shops. In the Cincinnati centerless machines the grinding wheel is carried on a fixed mount which is integral with the bed. There are two slides. On the lower slide the work rest is mounted. The upper slide is mounted on the lower slide and carries the regulating wheel unit. The lower slide can be locked to the bed and/or to the upper slide. It is thus possible to fix all three elements in one position, to fix the work blade with respect to the grinding wheel or with respect to the regulating wheel.

For thrufeed and endfeed work the first arrangement is used, with all elements locked together as shown in figure 1.

Most infeed work is done by locking the upper and lower slides together as shown in figures 2 and 3. This establishes a permanent relation between regulating wheel and work rest. Grinding contact is established by moving the regulating wheel, work rest and blade to the grinding wheel as a unit.

There are, however, certain conditions under which it is preferable to lock the lower slide to the bed, leaving the upper slide movable. In this set-up the work rest is in fixed position to the grinding wheel and the regulating wheel can be retracted from the unit. This makes for easier loading of small pieces by increasing the size of the V into which the parts are inserted, and is also safer. The arrangement is shown in figures 4 and 5.

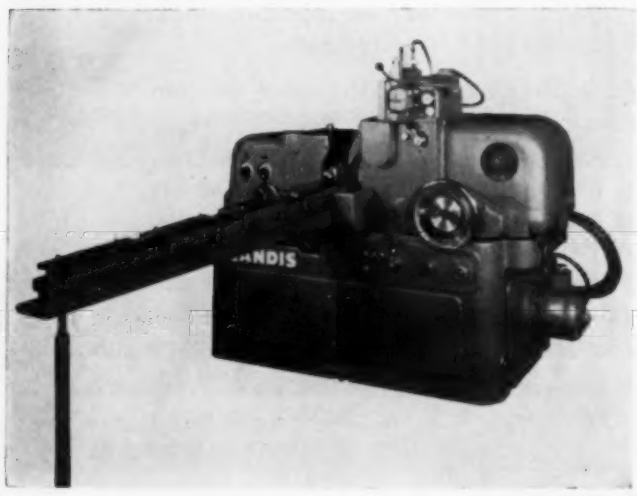
The locked lower slide set-up facilitates automatic operation for with a retractable regulating wheel, fixtures can be designed which permit gravity to be used for ejection of the finished parts. See figure 6.

In figures 7 and 8 are shown the use of double work blades which are useful for many parts in preventing the marring of the work surface by a possible grinding action of the regulating wheel.

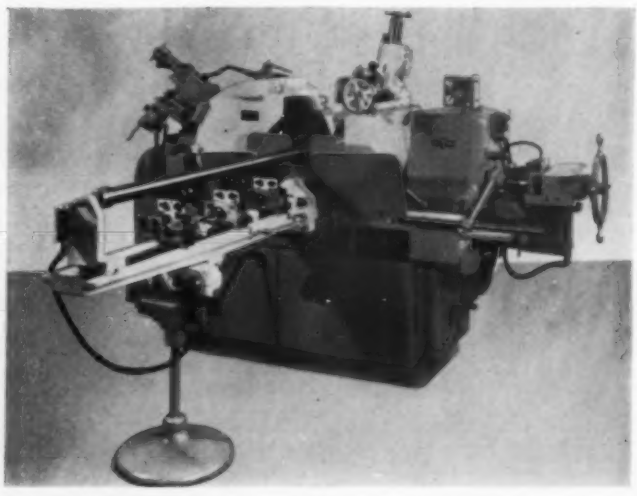
The sketches in figures 1 to 8 are by courtesy of Cincinnati Grinders Inc.

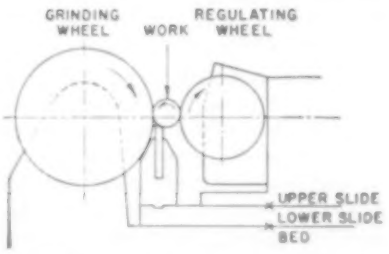
Tapers are ground on Cincinnati machines by the endfeed method with the grinding and regulating wheels and the work blade set in the fixed relation to

Bar grinding attachment for a No. 12 Centerless. Includes both front and rear guides.

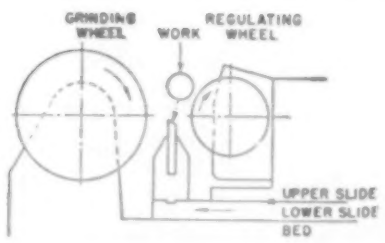


Thrufeed work holder. Bars with shoulders on each end.

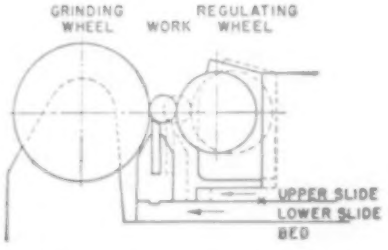




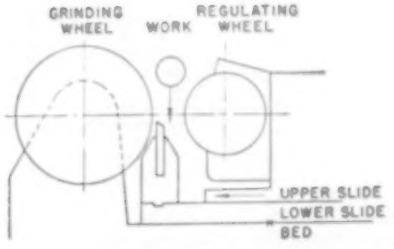
1. Bed and both slides locked together to keep both wheels and work rest in fixed relation for use in thru-feed and end-feed grinding.



2. Upper slide locked to lower, keeping regulating wheel and work rest in fixed position to each other. Loading position for much infeed grinding.



3. Work rest and regulating wheel moved together toward grinding wheel. This is grinding position.



4. Another set-up for infeed grinding, which makes loading of small pieces easier. Lower slide is locked to bed.

each other. The grinding wheel or the regulating wheel or both are dressed to the required taper and the work is fed to an end stop.

In the Landis and Lidkoping machines, the work rest is mounted directly on the machine bed, both wheels being movable. Tapers are ground by the infeed, or plunge, grinding method, the faces of both wheels remaining parallel to their axes and the required taper being secured by swiveling the regulating wheel base, as in figure 9.

Both the Cincinnati and Landis machines use bevel topped work support blades, while the Lidkoping blade has a V-shaped top as shown in figure 10. During grinding the work rests only on the inclined surface of the V that is nearest the grinding wheel. The effect of the V-shape is essentially that of the double blades, each of which are beveled, sometimes used on Cincinnati machines for large or heavy pieces.

Attachments of various sorts are important in many types of centerless grinding.

With some kinds of work it is not sufficient to hold the work in position merely by means of the interaction of the regulating and grinding wheels with the work support blade.

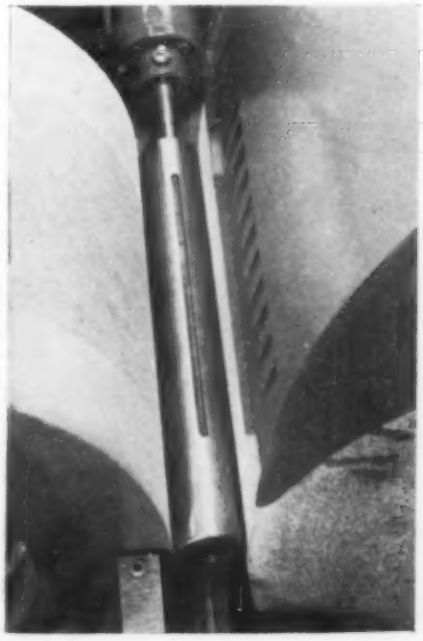
In one job done on a Lidkoping machine it was deemed advisable to perform a centerless grinding operation with the help of centers. The parts are torsion spring bars used in a European motor vehicle. They run from 8 in. to 3 in. in diameter and from 24 in. to 100″ long. Both ends have toothed heads.

Experience has shown that they are best ground if held between spring loaded centers, held in tail stocks so designed that the centers are free to move in any direction. The axis of rotation is thus not determined by the centers, whose only function is to support the overhanging part of the rod which is not being ground. The actual grinding is done by the centerless method.

Many attachments have been devised to hold a piece in place when it must be ground at a point on the machine other than directly opposite the regulating wheel. The simplest are roller rests which merely support the overhanging portion of the part. Figure 11 shows such an arrangement for grinding the base only of a projectile.

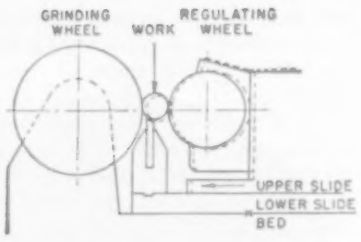
Bar grinding attachments are of this sort. Small diameter work is usually

This slotted 2.0528-in. guide pin is a difficult centerless grinding job. Production is 120 pieces per hour on this 2-in. dia. work. Stock removal is .012-in.

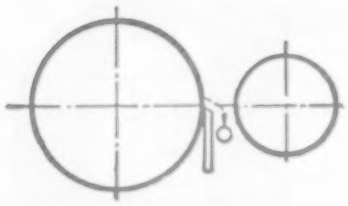


This outboard roller support is used when grinding an upper seal tube. Stock removal is .005-in. to .010-in. and production is estimated at 100 to 150 pieces per hour to a 60 micro inch finish.

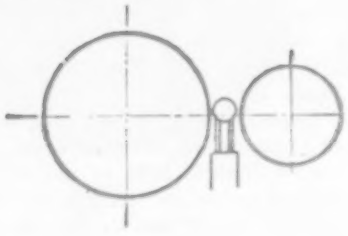
Grinding glass pistons for hypodermic needles. Air operated ejector application. Production is 36 pieces per hour. Stock removal is .018-in.



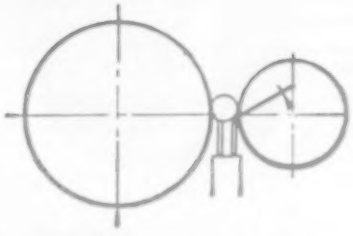
5. Grinding position with lower slides locked to bed. Regulating wheel alone moves to establish grinding contact.



6. With lower slide locked to bed, and regulating wheel retractable, fixtures can be dressed to make ejection of work automatic by utilizing gravity.



7. Load.



8. Grind. Double work blades help prevent possibility of marring work surfaces by grinding action of regulating wheel.

supported on guide rests. Large diameters are best supported on roller rests, usually employing three rollers, to act, both as supports and as a hold-down device. Very long bars can usually dispense with hold down devices, support of the bar at both entering and exit side of the machine being all that is needed.

For very long bars and shafts of large diameter, Lidkoping uses power driven rollers in order to relieve the wheels of part of the work of rotating the bar. It is claimed that this results in greater output, more economically.

The power driven bar grinding attachment consists of two wide cast iron tables which can be adjusted vertically and transversely.

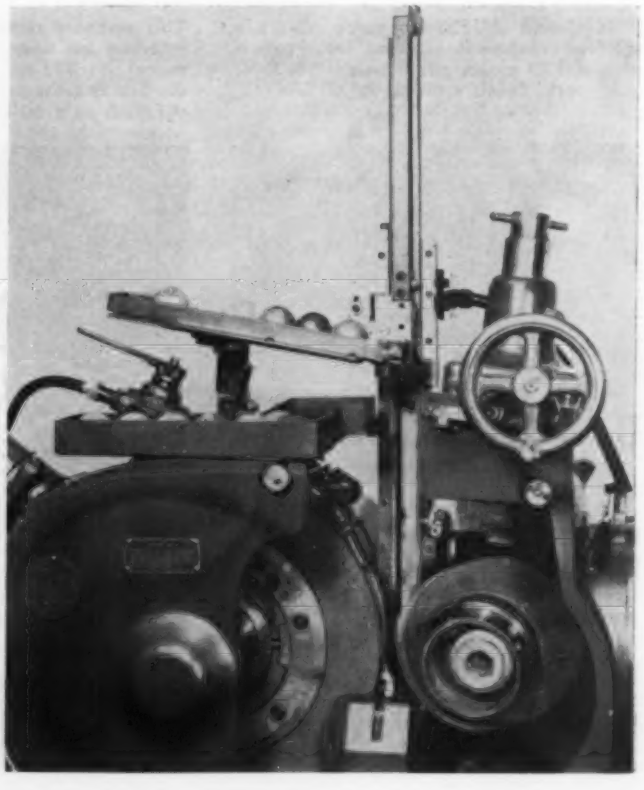
The pressure roller method which is often used for off-set grinding is essentially the grinding of work held in a centerless chuck, which is made up of the work rest, the rollers and the regulating wheel. This arrangement may be used to grind diameters concentric with one already ground, or one which is a definite amount eccentric to another. For eccentric grinding, the shaft is held eccentrically in a cylindrical shuttle which is rotated in the "centerless chuck."

Collets and arbors of special design are often useful for holding difficult parts. The part shown in figure 12 is typical of what might be called a "borderline" centerless job. It was desired to grind the inside face lightly while grinding the neck. The shortness of the piece compared to its diameter posed a holding problem. A chucklike holder using collet rings for holding the piece was designed. The chuck is attached to a rod which projects over and is supported by the work rest at the other end. While the neck is being ground the operator presses against a knob on the other end of the device to press the neck of the piece against the side of the grinding wheel.

In figure 13 is shown a piece presenting a similar problem, which was solved

When an infeed part is ground all over, or off both ends, hand loading is frequently unsafe or impractical. This mechanical elevating and lowering attachment, connected with the hand infeed lever, brings the loading position up to a safe location.

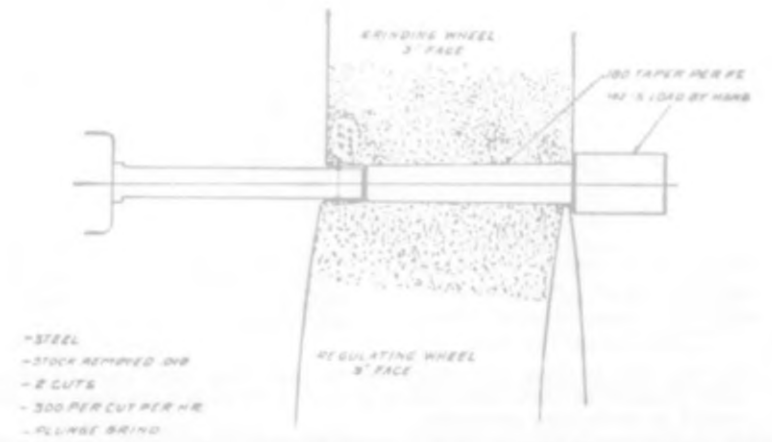
Some interesting points of this fixturing: inclined loading tray at top left; horizontal unloading tray at left center; hollow "tee" just receiving ball from loading tray.



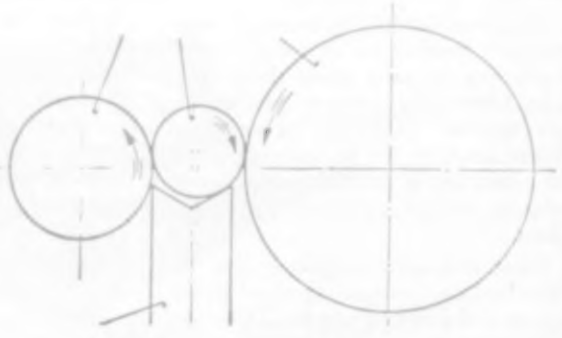
in an entirely different way. In this instance the outer bearing race, which must be ground on both the diameter and the flange, is placed over the end of an arbor and advanced to the work position by a pusher type loader. When the regulating wheel is advanced, the part is pushed up the angular face of the work blade out of contact with the arbor, and so against the grinding wheel. The part is pressed against the side of the grinding wheel for grinding the shoulder by the regulating wheel which is given reverse feed for the purpose.

The part sketched in figure 14 is a sample of material which is to be tested for tensile strength. It is centerless ground to make certain that the area of the section will be highly accurate and without bending, compressing or setting up stresses from heat in the test sample. It is ground from a solid cylinder on a Cincinnati machine. The finished piece has two straight and four tapered sections.

Loading the straight piece would present no problem, but unloading the deeply recessed finished piece would be difficult without a special fixture. The fixture is a cradle which is lowered between the wheels from above. A roller on the linkage follows a cam which guides the work vertically to insure that it will clear the wheels before being moved out. Without such a device

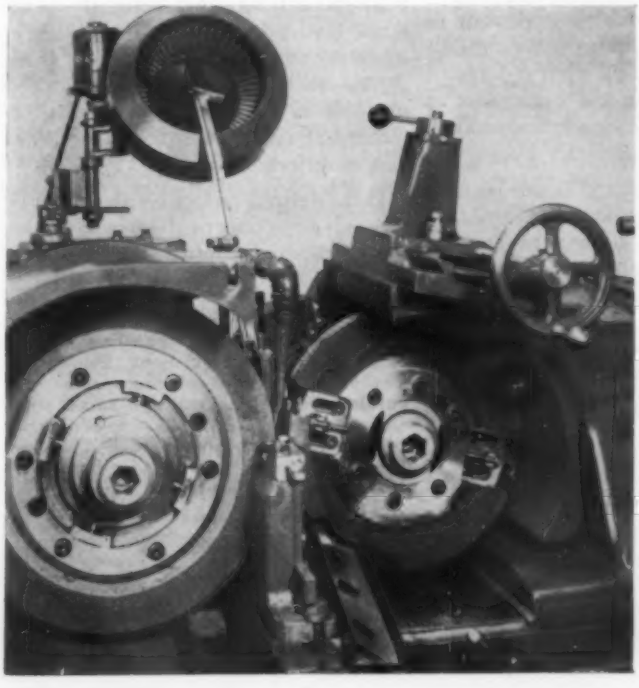


9. Tapers are ground on a Landis machine by swiveling the regulating wheel.

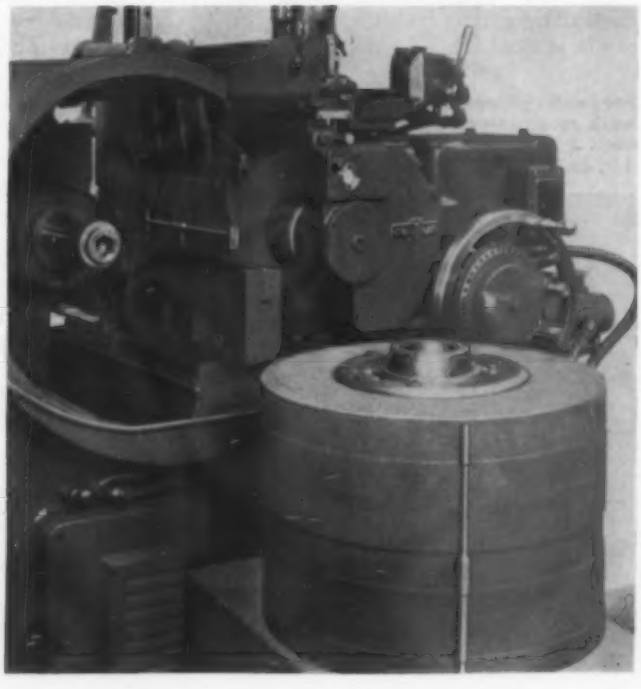


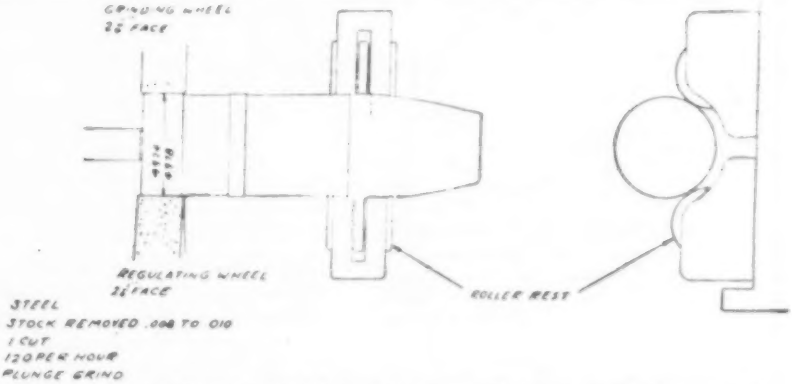
10. The work blade on a Lidkoping centerless has a V-shaped top. During grinding, the work rests on the bevel nearest to the grinding wheel.

Grinding fountain pen tips. In the center upper portion of the photograph is a view of the rotary feeding hopper. The regulating wheel has two notches and a piece is ejected as a notch comes around and an unground piece is loaded between the wheels immediately after. In this way two pieces are ground with each revolution of the regulating wheel.
The regulating wheel is trued to a cam shape. Right after the notch the work starts to grind and as the regulating wheel continues to rotate it grinds the part to the finished size. The piece is then ejected as a notch comes around to position.

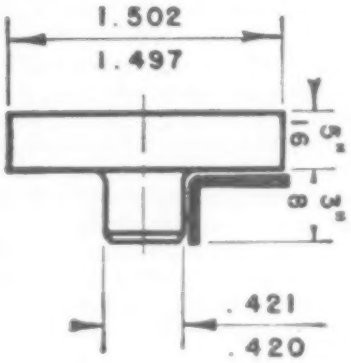


This grinder accommodates 20-in. wide wheels with profile truing attachment to accommodate 20-in. cams. Shown here is the set-up with a wheel trued to the proper shape to grind textile spindles. Pieces are loaded between the wheels by hydraulic elevating and lowering attachment. This can be seen approximately in the center of the photo. A textile spindle is in position on the blade.





11. Top view of roller rest attachment for supporting outer end of projectile while diameter at other end is being ground. Some such arrangement is often needed in peace-time production.



12. This piece is held in a special collet type attachment for grinding.

there would be danger of dropping the piece between the wheels when unloading.

Automatic loading by means of magazines or hoppers can be used to speed production on parts whose design permits. Often they make it possible for one operator to handle several machines, since all that he has to do when the operation is fully automatic is to keep the magazines filled with workpieces.

Some automatic magazine feed devices feed the parts for thrufeed grinding in a continuous stream. However, if the parts are of such shape that they may interlock it is advisable to feed them one at a time. This does not prevent automatic operation, although of course it slows production.

While not, strictly speaking, an "attachment" the work blade is a highly important adjunct to the centerless grinding machine.

Most centerless grinding is done with work blades having an angular top, because of the greater rounding effect that can be secured. The action is quite complex, but essentially it amounts to this: With a flat top blade, when a low spot on the work comes in contact with the blade or the regulating wheel, the tendency is for the grinding wheel to produce a correspondingly high spot. This tendency is lessened when the work is positioned lower—that is, nearer the center lines of the wheels. When a low spot comes in contact with the angular top of a blade, the work obviously sinks lower, more material is removed from the high spot and the true cylindrical shape is gradually produced.

From that it might seem desirable to have a steep angle on the blade, to expedite the rounding action. However, the angular top produces horizontal pressure which has to be resisted by the blade. With steep angle and a wide blade this pressure may become far too great. So it is good practice to reduce the blade angle for the wider cuts.

For example, a given piece of work may be properly ground with a 4-in. wide cut on a blade having a 30 degree angle. Increasing the width of the cut might make it advisable to reduce the blade angle to 20 degrees. That reduces the lateral pressure on the blade. For the same reason, the blade angle should be smaller for larger diameter work.

For blades with a single bevel; such as is used in the Cincinnati machines, the thickness of the blade runs from ½-in. to ¾-in.—depending upon the diameter of the work. For work pieces of small diameter the part of the blade that supports the work should be slightly thinner than the diameter of the work. Use the thickest possible blades for large diameter work. In short, the thickness of the blade is determined by work diameter while the length of the blade is determined by width of the wheel.

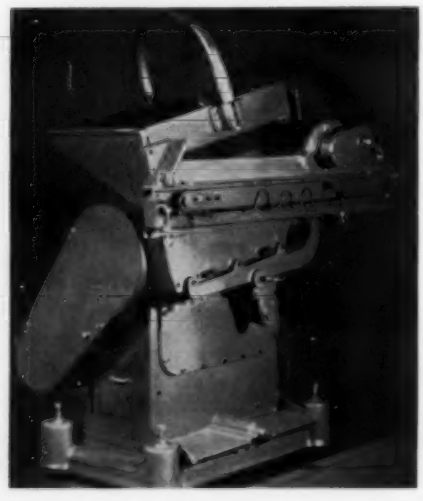
The finish secured with centerless grinding depends to a great degree upon the material used for the work blade's wearing surface. Exactly which material to use for the blades depends primarily upon the work material.

Cemented carbide inserted blades have the widest application. They are suitable for cast iron, hard and soft steel, some of the harder stainless steels, non-ferrous metals and the various nonmetals such as plastics, glass and so forth. Altho carbide insert blades are higher in first cost, the cost per piece produced is lower because the carbide blades require fewer regrindings.

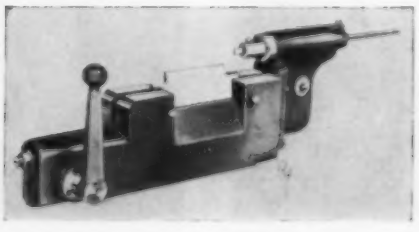
In shops where it is necessary to reshape blades frequently to make them conform to various shapes of work pieces—as in a job shop—high speed steel blades may be preferable to cemented carbide blades due to the lower cost of grinding them.

If the desired surface finish cannot be secured with cemented carbide blades, the condition can often be rectified by

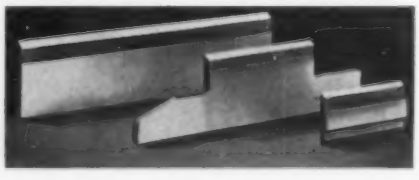
Feedmatic hopper automatically feeds the work to machines. Available for Nos. 2 and 3 Cincinnati. Capacity ¼-in. to 1½-in. dia. short lengths.



Infeed work rest. Standard arrangement shown with hand ejector. May also be fitted with additional parts, connected to infeed lever for automatically ejecting the work.



Blades and guides for centerless grinding machines. Majority of thrufeed, infeed and long bar attachment blades are available in choice of three materials: carbide, cast iron, and high speed steel. Other attachment blades available in carbide and high speed steel. Cast iron blades are solid material, others have inserts in soft steel body.



changing the blade material to Meehanite or grey cast iron. This is often true when grinding certain grades of stainless steel. However, a satisfactory finish can often be secured on stainless steel, while using cemented carbide blades, by adding a greater amount of soluble oil to the coolant.

No discussion of centerless grinding practices would be complete without mention of the Heald Internal Centerless Grinder. This machine, a joint development of General Motors Corporation, Cincinnati Milling Machine and Cincinnati Grinders, Inc., and the Heald Machine Company, is entirely automatic in operation.

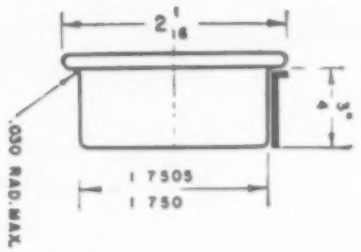
In internal centerless grinding, it is not possible to pass the work through the machine, but the rotating regulating wheel together with a rotatable work rest or stationary blade and pressure rolls is used. The regulating wheel rotates and governs the speed of the workpiece while the grinding wheel is removing material from the bore. In establishing the equivalent of the conventional grinding throat, the regulating roll takes the place of the grinding wheel of the external centerless grinder, while the pressure roll takes the place of the regulating wheel.

Another interesting device is conventional centerless grinding is the cammed wheel. In normal practice, either the grinding wheel or the regulating wheel or both are moved in and out on their slides during loading and unloading movements. An appreciable amount of time is lost moving these members in some circumstances.

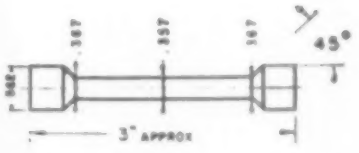
The cammed wheel, which is redressed in place when necessary, drops the finished piece when the low point of its periphery is opposite the work rest blade which then receives a new piece, accurately timed, from the magazine or other automatic feed. It is not necessary to retract the slides on which the feed wheel is mounted because the workpiece is cleared through the cammed portion of the wheel. Because of this fixed relationship and because it is further unnecessary to accelerate and decelerate these heavy slides, a consistent accuracy and maximum production over longer periods of operation are claimed.

In addition, the cammed wheel has a very satisfactory wheel life since the roughing is always done in the same peripheral range, and the finishing quadrant only touches the work when it is near final size. Obviously, this operation is geared to turning out one complete piece with each revolution of the regulating wheel. In some operations, a double-cammed wheel is used, with a complete piece being ground and dropped out at each one-half revolution of the regulating wheel.

End of part 3. Part 4 will appear in the February issue.



13. This bearing race is held loosely on an arbor for loading and unloading. The regulating wheel lifts it off the arbor and against the grinding wheel.



14. Sample piece to be tested for tensile strength. It is centerless ground to make certain that the main body will be accurate.

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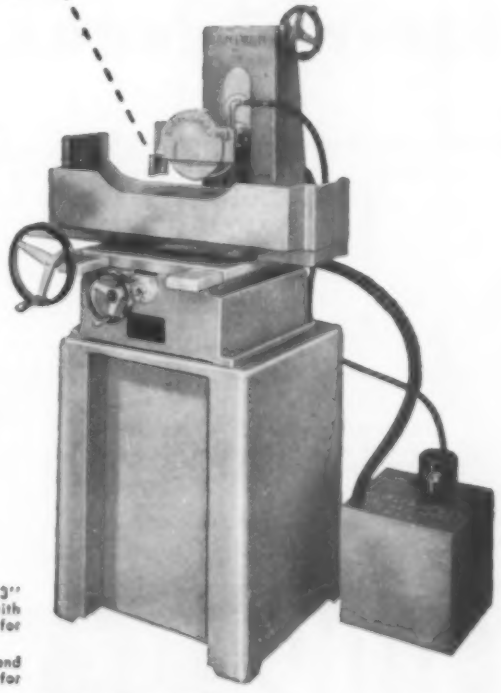

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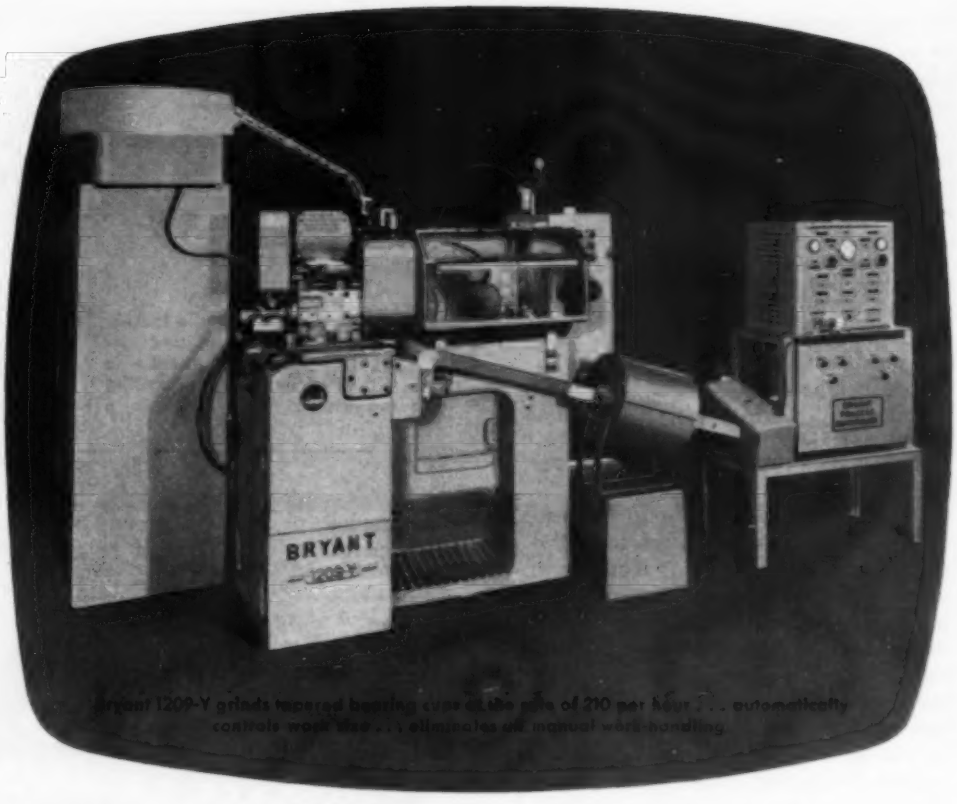

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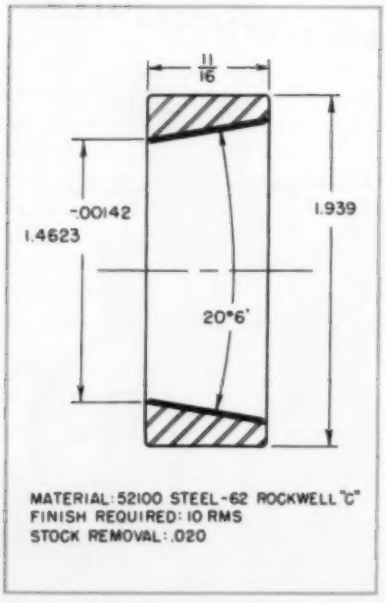

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Watching part of a big pay-off is Beech Aircraft's Jack Love as . . .

$200,000 in Annual Savings

Are expected on deburring and finishing operations

By Frank Pedroja
Beech Aircraft Corp.
Wichita, Kansas

● Mechanical deburring methods recently adopted at Beech Aircraft Corporation, Wichita, Kansas, are expected to pay off to the tune of $200,000 annual savings in costs over hand methods in deburring of machined parts. Installation of the new equipment, which includes shot blast, tumbling and liquid blast types, was made as a result of methods studies by Cameron C. Miller, Beech methods engineer, aided by C. L. Mattix, plant machinist.

Studies indicated that approximately 70 per cent of Beech machined parts were adaptable to mechanical deburring—at an estimated time saving of 50 to 70 per cent over hand burring. Trial runs on sample machined parts were made at plants producing the machines, with satisfactory results, as approved by Beech engineering, structures, metallurgy, and quality control.

Newest of the units installed at the Beech plant is a shot blast machine, of the Tumblast, or shot-peening, type. Aluminum or steel wing fittings are among the parts from which surface scratches are removed by this method, using runs of from six to twenty-five minutes. Shot of .017-in. diameters are used, and Mattix claims much faster and better finishing than hand methods. Four advantages of shot blasting over sand blasting are given. (1) The shot will not imbed itself in the material; (2) Shot doesn't leave sharp indentations which might be considered stress risers; (3) shot peening adds to surface hardness; and (4) shot blasting sets up three-

Finish of a Beechcraft main spar fitting just shot blasted is inspected by machinist C. L. Mattix and foreman E. M. McFarland of Beech's Department 801.

dimensional compressive stress to offset residual tensile stress, increasing fatigue life of the part.

Where shot blasting would have too harsh an effect, a wet tumbling unit is used. Here, wing spar fittings, castings, forgings, and various small parts are tumbled with abrasive rocks and soap compound.

An example of the efficiency of wet tumbling from the Beech plant is that of processing 2000 hooks for the tongues of model MD-3 generators, designed and built by Beech, where the removal of sharp corners is required to prevent cracking. Wet tumbling completed the whole job in ten hours—the same length of time formerly required to clean only 140 of the parts by hand.

A magnetic separator is used to great advantage in the Beech plant to separate small parts and tumbling media. Recently 7000 canopy rollers for the twin engine Beechcraft C-45H, Air Force trainer-transport, which were similar in size to the tumbling rocks, were separated in a matter of ten minutes.

A third type of deburring machine in use in Beech's department 801 is a liquid blast machine, in which fine grit mixed with water is blasted against the part using 100 pounds air pressure. Protected by rubber gloves, the operator directs the blast against the part, obtaining the high finish possible with the liquid honing method, without excessive metal removal. ● ●

Beech leadman D. V. McLaren and methods engineer C. L. Miller watch the operation of wet tumbling machine.

NO. 6 OF A SERIES
ON THE HISTORY OF ABRASIVES
BY CHICAGO WHEEL & MFG. CO.

THE FORERUNNER of the MODERN GRINDING WHEEL appears in the Middle Ages.

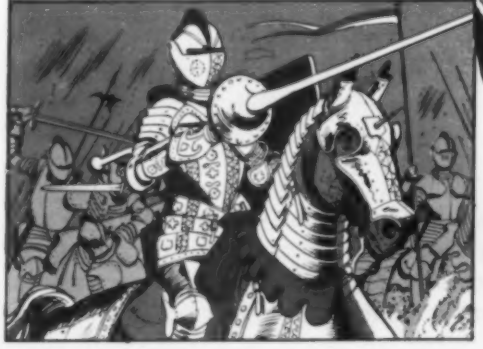
First records of a wheel used to grind or polish metal appear in the Middle Ages—the period roughly between 800 and 1400 A.D. Metal-working reached artistic heights in Europe during this period, particularly in the use of iron and steel for armor. Gold and silversmiths also produced striking examples of their art during this time.

EUROPEAN HISTORY is not specific about the introduction of the vertical wheel for grinding. Many historians believe it originated in the Orient as early as the 3rd century and filtered into Europe during the Crusades, or with the Moorish invasion of Spain. It is known that the blades of the Moors were amazingly sharp, indicating a finish that couldn't have been given them with the forger's hammer or by hand abrading.

THE FINAL POLISH on world famous Toledo steel blades was produced by emery powder on wooden wheels. Evidently, the emery powder was sprinkled on the wheel as it turned. This forerunner of the modern grinding wheel is first mentioned in the year 900 A.D. It is doubtful if they appeared in France and England before 1100 A.D.

IN ENGLAND at the turn of the 14th century, there are a number of references to "grindstones," one in particular mentioning the "grindstone with an iron-axle tree." Because of the coarseness and irregularities in the grain of the stone, it is believed these were used for less exacting metal grinding, the fine work still being done by hand.

ABOUT THE YEAR 1450 chain mail combined with steel plate gave way to entire suits of plate armor. These are magnificent examples of metal-working, representing the highest skill attained by man in working steel without machinery. The brilliant satin finish on the metal was brought out by burnishing with emery and pumice. The suits were made mobile by clever fitting of metal to metal, ground to exacting tolerances.



Where craftsmen in the Middle Ages had to design and make the tools they required, today's mass production techniques enable us to produce any number of identical tools of the same design. This is true even of such difficult-to-control products as mounted wheels. Chicago Wheel, through positive production control, can now turn out mounted wheels and points which are alike in every detail—in shape, grain, grade, and structure, and in results. We'll gladly send you two samples to test in actual production. Just write us on your letterhead.

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Electronic computing equipment has been linked with a punch card system to calculate

"Electronic Formulation" Reduces Human

New electronic computation equipment, using the established constant data, now can precisely figure the grinding wheel formulas to produce any specification in any size and quantity that may be ordered.

WESTBORO, MASS. . . . Grinding wheels are used throughout industry in literally thousands of variations. This is because every grinding job is different. First, a grinding application is analyzed by an Abrasive Engineer who determines the grinding qualities needed. He then recommends a wheel specification that will furnish these qualities. The manufacturer, in turn, calculates **a formula** for every grinding wheel specification ordered. The formula tells the factory the proportion of ingredients that will be needed to make a wheel which will match the specification of the engineer. The formula is the link between field engineering activities and the company's manufacturing facilities, and, as such, is a vital phase in the manufacturing process.

The new electronic formulation system at Bay State Abrasive Products Co., Westboro, Mass., now calculates in seconds what a complete department could produce in a day and performs these calculations with a consistent accuracy beyond human capacity.

automatically the manufacturing formulas for grinding wheels produced by Bay State

Errors . . . . Assures Accurate Duplication

First steps in the establishment of the program were taken at the Harvard University Computation Laboratory with the help of their famous Mark IV Computor, where thousands of man hours of calculation work were performed in the space of only 1½ hours. By the use of this equipment, every increment in grinding wheel hardness and abrasive grain concentration was calculated and spaced equally along straight line progressions.

Bay State's new electronic computation equipment, using the established constant data, now can precisely figure the grinding wheel formula to produce any specification in any size and quantity that may be ordered.

Briefly, the system works like this: When an order for grinding wheels is received, the "constant" formula data, plus the variable information; such as, quantities, packaging and shipping data, etc. is all "fed" to the computor. Manufacturing instructions, ingredient by ingredient, plus the other instructions are then "delivered" from the equipment, all typed on manufacturing forms which then go directly to the factory. The possibility of human error in these calculations has been completely eliminated.

Every card carrying the important "constant" data is kept on file so that on the next order and all orders thereafter, the grinding wheels will be formulated exactly as before. This duplication insurance is important to company and customers alike.

In addition to calculating grinding wheel formulas, the system collects other vitally important data. The amount of raw materials used can be stored while the formulation calculations are taking place and later be tapped off as they are needed. Vital overall marketing and sales statistics are determined and preserved.

According to Bay State management, it is not too far in the future when similar electronic computing systems will be applied to the manufacturing processes with the actual ingredients of abrasive products being physically selected, measured, combined and processed. ● ●

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If grinding problems have you caught in the middle and you don't know which way to turn, switch to CINCINNATI (PD) WHEELS. For *now* CINCINNATI Grinding Wheels offer POSITIVE DUPLICATION —a remarkable achievement in precision manufacturing and quality control that *can save you money . . . and increase your production.*

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Yet CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.* So, we think you'll agree it's worth taking a close look at CINCINNATI (PD) WHEELS right away.

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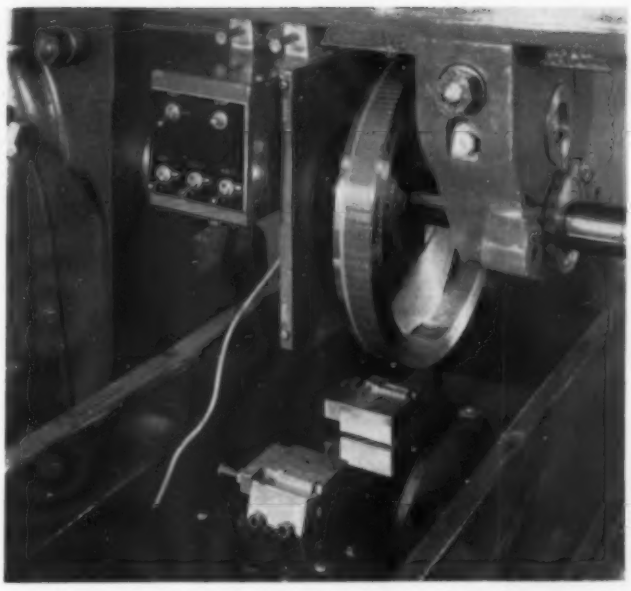
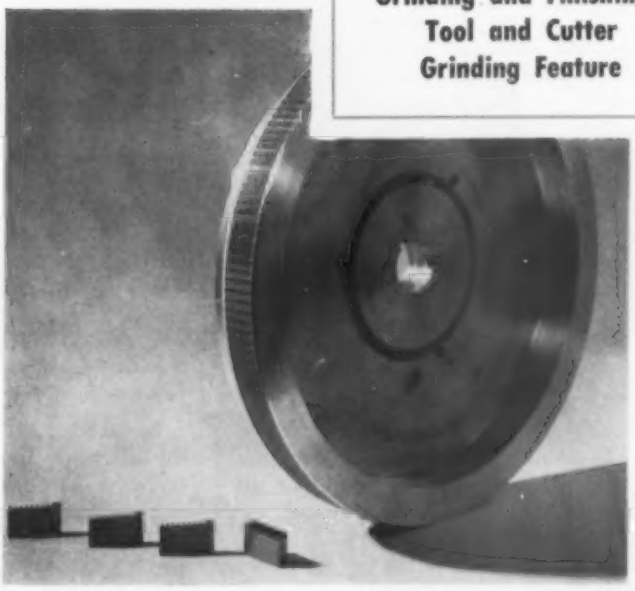
Grinding and Finishing's Tool and Cutter Grinding Feature





Procedure for form tool cutting by Electrical Discharge Machining. View shows a mechanical form tool for dressing the brass wheel and the actual cut in the part. These are tungsten carbide, internal thread chasers. Roughing time is 8 minutes and finishing time is 7 minutes. There are no heat checks or feather edges and no further clean-up necessary. A heavy duty milling machine has been adapted for electronic cutting. Any other metal or shape can be readily formed.

What can you grind . . .

What savings can you expect from . . .

Electrical Discharge Machining?

By **H. V. Harding,** Technical Asst. to President
Elox Corporation of Michigan
Clawson, Mich.

- ✓ *tolerances of .0002-in. are possible*
- ✓ *a brass wheel is used which can be rotated horizontally or vertically*
- ✓ *process increases tool life*
- ✓ *heatchecks eliminated*
- ✓ *it costs $30 to grind one cu. in. of carbide, with brass wheel cost is $3 per cu. in.*

• Thin slots, a few thousandths wide can be ground in any type metal, from carbide to soft alloys, the size only limited by the toolmaker's ability to form a thin brass wheel or disc. Multiple slots .008 in. wide are now being ground in hardened steel on production runs. The grinding of complicated form tools to a tolerance of plus or minus .0002-in. can be readily performed, if the brass wheel and the machine can hold that tolerance. These, and other, grinding operations can be performed by a new process.

This new electronic process for removing metal is known as Electrical Discharge Machining, and has been developed by the Elox Corporation.

There are many concepts and techniques in this process which distinguish it from conventional means for grinding and which have been proved to be beneficial to the user.

One of the most important features of the process is incorporated in the control apparatus. Any surface may be selected by operating simple switches and the operation of the equipment and the principles by which it removes metal are quite simple. For sinking a hole or shape in any metal, it is first necessary to have brass electrodes of the desired shape. These should be slightly undersize if extreme accuracy is desired. For roughing work with broad limits as much as .008-in. undersize can be tolerated. For very fine, close tolerance work, .0005-in. undersize or less is necessary. Tolerances of .0002-in. in the workpiece are possible, providing, of course, that the electrode, the machine and fixturing equipment is held to these limits, as in any standard machining job.

When the electrode approaches to within approximately .001-in. of the work, electrical discharges take place across the gap between the electrode and the workpiece. These occur through a film of insulating oil. These discharges are streams of electrons which strike the work at a microscopic point. At this point the metal is vaporized, acquiring a positive charge and instantly jump back toward the electrode which is, of course, negative. The energy is cut off and the ionized particles are condensed and washed from the gap by the coolant.

The process depends upon the fine controls necessary to maintain a predetermined gap, measure a definite value of energy across the gap for cutting the metal, time these discharges to prevent any heating of the part, and wash the minute cuttings from the working face, for fast efficient operation.

Exactly the same principles are employed when grinding. A brass wheel is used and can be rotated horizontally or vertically, depending on the application. The table is moved, electronically, toward the wheel by the same type of controls.

In grinding a precise formed tool, the first step would be grinding the tool in the conventional manner and checking it for accuracy. Next, a dual fixture is fastened to the bed of a horizontal mill. The forming tool or tools are then secured in line with a brass wheel, approximately 10-in. to 12-in. in diameter and at the correct angle for dressing the periphery of the wheel to the shape of the form. The work is secured in line in the other end of the dual fixture at the proper height to permit forming to the full depth. Three speeds of cut with three different finishes are usually used. (a) The roughest cut to remove the bulk of the metal, (b) a medium cut and finish to a clean-up point of a few thousandths from finished size and (c) the final fine finish to dimension.

In each case, there is a single pass; the machine does not oscillate or reciprocate. With each pass the table is run back until the dressing tool makes contact with and resizes the wheel to finish contour. There is a columetric loss of brass in the actual cutting operation of approximately 3:1 in the carbides and 1:1 in steels.

Form tools ground by this process exhibit the same characteristics as any other tool ground by this process: sharper edges, non-directional surface, no smearing, no heatchecks and a much longer life between grinds. Depending upon the particular type of cutting being performed, tools ground by this process have given a greatly increased percentage in extended tool life.

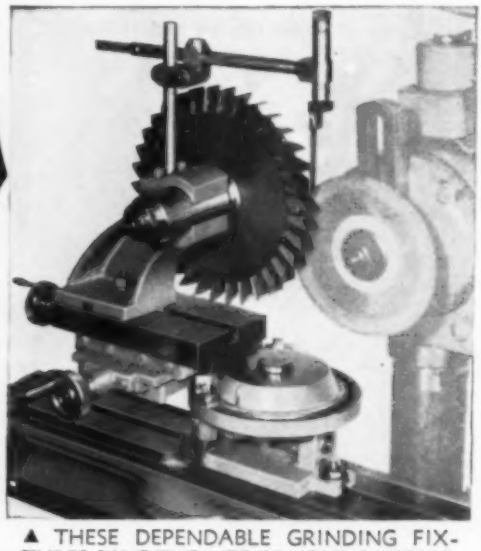
The elimination of all heatchecks is probably the most important factor in extended tool life. Where there is no smearing or feather-edging, the use of a diamond hone is not necessary. This results in the sharper cutting edge, permitting a constant, even cutting action with very little breakdown of the tool.

Differences in this method compared with conventional grinding are many. Besides the absence of heat checking and cracking, the exit and entrance cut are identical, and there are no directional scratches. Insert tools, such as rounds, squares, triangles, etc. are sharpened by using a brass wheel. All sides are cutting sides. One large company makes a bundle of tools, clamps them together and grinds all of the tools in the bundle in a single pass. These Elox grinders have no reciprocating action during the grinding operation and there is no danger of loading the wheel as the wheel and the work never come into physical contact. As a result of this, carbide, silver solder and steel can be ground simultaneously.

THE UNIVERSAL RADIAL CUTTER GRINDING FIXTURE

Does 5 Operations without removing cutter from its ARBOR!

On cutters up to 8" in diameter, the No. 6 fixture, as shown with our No. 6A heavy-duty, right-angle, ballbearing spindle workhead:
Sharpens side teeth on **both** sides.
Sharpens peripheral teeth.
Generates small or large radii on **both** corners of each tooth.
(Other workheads available)

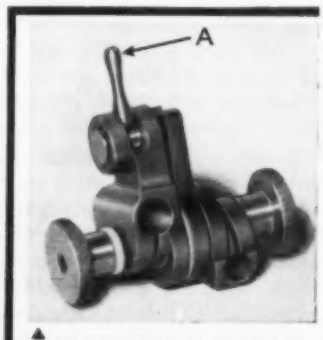


▲ THESE DEPENDABLE GRINDING FIXTURES SAVE THE LIFE OF YOUR CUTTERS. Write for our catalog 602

Radial Grinding Attachment D combines with Unit 1A for sharpening end mills with square, conical, or ball nose shapes. ▼

◀ UNIT 1A
This Universal Cutter Grinding Fixture fits any universal tool or surface grinder.

▲ UNIT 4A
Radial Grinding Fixture for sharpening fluted end mills with square, conical, or ball-nose mills. The index disc provides for multi-flute cutters.



▲ NEW FINE-ADJUSTMENT SLIDING SWIVEL GIVES SMOOTH, PRECISE INDICATOR SETTING. Smooth, positive positioning of finest dial indicator is readily accomplished by the fine-adjustment Sliding Swivel. Final precise positioning is accurately made by slight movement of convenient lever "A".
WRITE FOR:
SLIDING SWIVEL FOLDER

ROCHELEAU TOOL & DIE CO.
650 North Main St., Leominster 1, Mass.

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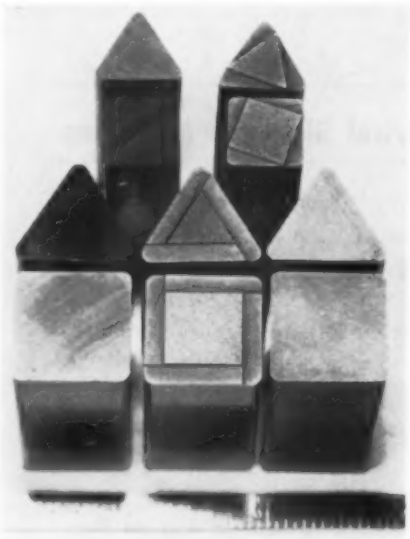
An Elox adapted vertical mill with a revolving brass wheel for surface and chip breaker "grinding" or, by locking the spindle, die sinking. Any metal can be surfaced, as the wheel never touches the work.

Users of this process can expect large savings as a result. It costs approximately $30 in diamond wheel to grind one cubic inch of carbide. It costs less than $3 in brass to grind the same volume; a rate of 10:1 savings in wheel cost. It is also faster to grind carbides by this process than it is with diamond wheels. Metal removal rate on a standard dual power supply grinder is .005 cubic inches per minute, for the average cut.

Where a shaped hole has to be made in carbide, invariably the blank has to be sectionalized, carefully diamond ground, fitted and mechanically held in place. Such a die can now be made in a single pass, using a brass electrode. The brass electrode is stepped, where the bottom portion is approximately .006 in. smaller than the desired hole. This permits fast cutting or roughing to within approximately .002-in. of finish size with a metal removal rate of .0025 cubic inches per minute. When the reduced size has passed through



Two views showing chip breakers ground in carbide tools. Below, a comparison of finishes between electrical discharge machining and conventional grinding of carbides.

K-7

BY THE MAKERS OF Lusol

MORE GRINDING means

BETTER GRINDING

AT LOWER COST

A TRANSPARENT ALL-CHEMICAL SOLUTION FOR GRINDING

Lusol K-7 is a new all-chemical liquid concentrate designed for a wide variety of grinding operations. It is recommended for use on all steels and is particularly suited for cast and malleable irons, titanium, carbon, rubber, ceramics and plastics. Instantaneously soluable in any water, hard or soft, it forms a clear, transparent, colorless solution that resists contamination, settles chips super-fast, and remains clear after repeated use. It is non-foaming and runs absolutely flat under all conditions. It provides maximum rust protection for all ferrous metals, including cast and malleable irons. It maintains clean wheels at all times. They just don't load up when you use Lusol K-7. For better grinding every time, use Lusol K-7. Write for complete information.

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PRESSURELOK-224
RESINOID DIAMOND WHEELS
— the best diamond wheel bond ever developed —
if you've used them - you know they're best!
if you haven't - let us show you!
UNITED STATES DIAMOND WHEEL CO. AURORA, ILL.
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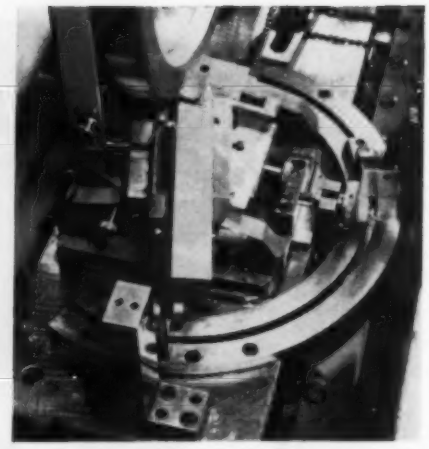


New, automatic fixture eliminates off-hand radii grinding on carbide tools. This fixture is used in conjunction with electrical discharge machining. One man can run two machines.

the work, the controls are changed by the snap of a switch and the full size upper portion of the brass electrode "sizes out" the die. Tolerances of .0002-in. at the cutting edge are quite possible. There will be a normal taper of approximately .0006-in. to the inch in such a die. If absolutely necessary, the electrode can be used as a lap to remove this small taper. This is sometimes required for powdered metal dies. (Reversal for blanking).

The inaccuracies of off-hand grinding radii on carbide and other single point tools has been completely eliminated by a new, automatic fixturing device which is used in conjunction with the electrical discharge equipment. It is called the "Uni-Form" single point grinding fixture. One man can run two machines easily as once set for the approach or clearance angles and to the desired radius, it is only necessary to push the button. Using the slide of a cupped brass wheel mounted on the spindle of a tool and cutter grinder, the tool is set in the fixture and ground without further need of honing or other finish.

The top surface can be ground in the same type of machine or in other types if necessary. Vertical mills with horizontal wheels have been used for tap or single side grinding. A smaller wheel can be used to form chipbreakers on any tool.

The following table draws a comparison between the conventional and the electrical discharge machining way to manufacture a broach in carbide insert:

Conventional Methods vs. Electrical Discharge Machining

1. Blanchard grind	1. Blanchard grind
2. Mill ends	2. Mill ends
3. Hole layout	3. Hole layout
4. Drill and tap holes	4. Drill and tap holes
5. Mill angles	5. Mill angles
6. Mill tooth form	6. Mill tooth form
7. Soft inspection	7. Soft inspection
8. Wet surface grind steel body oversize	8. Braze carbide blanks in steel body
9. Step teeth in steel body oversize	9. Finish grind steel body to size
10. Taper teeth in steel body oversize	10. Taper teeth on Elox grinder to size. Use special fixtures.
11. Grind form in steel body to eliminate any possibility of expensive diamond wheel coming in contact with steel	11. Grind form in steel body and carbide teeth simultaneously
12. Grind tooth form in steel body with .012 back taper.	12. Sharpen carbide teeth.
13. Braze preformed carbide blanks in broach body in exact location to keep expensive diamond wheel grinding to a minimum	13. Backoff teeth
14. Wet surface grind body to remove any distortion due to brazing	14. Final inspection.
15. Step carbide oversize	
16. Taper carbide teeth oversize	
17. Grind form in carbide to clean up using 180 grit diamond wheel to rough and 320 grit to finish	
18. Step carbide teeth to correspond with size of form	
19. Grind sides and bottom of steel body to achieve proper size and location	
20. Sharpen carbide teeth	
21. Backoff teeth	
22. Final inspection. • •	

By **Morris S. Shipley,** President
and
William A. Biebel, Vice President

The Esbec Barrel Finishing Corp.
(Formerly Tumbling Sales and Service Co.)
Byram, Conn.

This is the fifth, and last, part of a series on Precision Barrel Finishing. The first part, September, dealt with Limitations and Applications; the second part, October, discussed Equipment; the third part, November, treated types and Uses of Compounds and Media; the fourth part, December, gave hints on How to Get Best Results With Precision Barrel Finishing.

It is anticipated that the entire series of five articles will soon be available in reprint form.

Organizing and Operating a Precision Barrel Finishing Department

"... it is actually true that many plants which now use files, wheels, belts or similar means for finishing can install a complete barrel finishing department and pay for its entire cost in as little as three months."

"... the training of the man who will have the ultimate responsibility for results is probably the most important item. If at all possible, he should be sent to the tumbling laboratory of the manufacturer of equipment or media for at least one week's training."

"... if more than five or six parts are to be barrel finished, it is advisable to set up a record system on the methods used for the various parts. Many parts require a deal of experimentation and if the parts do not repeat for a while the experimentation may have been wasted."

"... many plants with old equipment who have not followed more recent developments are unable to approach the results secured by their competitors who have modern equipment and use modern techniques."

Part 5.

● Thus far we have discussed the general applications of barrel finishing and how the results are accomplished. Having determined that the process will produce the desired results and effect substantial savings in production costs, as discussed in part 2, it is time to start planning for both an efficient installation and a smooth-functioning, profit-making department.

Studying the Possibilities

The first step is to talk to representatives of numerous manufacturers of equipment. Find out not only about their equipment but how much they actually know about the process itself and their ability to make it work in your plant.

Find out if they are merely manufacturers or have barrel finishing plants where they can process your parts. It seems obvious that, in dealing with a process which is much more of an art than a science, it is a waste of time to purchase equipment from a manufacturer who is not an expert in making his equipment work in the field.

First send a few parts for sample processing. If these show possibilities, ask the vendor to process a full production load (even if you have to pay for the processing) and ask him if one of your staff can come to his plant and actually see the parts processed.

Don't be satisfied with the results produced by one manufacturer. Give sample parts to at least two,

and possibly three. You may be surprised at the difference in results.

Once the process has been proved and the required equipment selected, you are ready to plan for actual production. But it involves much more than merely allotting some floor space to the operation.

The training of the man who will have the ultimate responsibility for results is probably the most important item. If at all possible, he should be sent to the tumbling laboratory of the manufacturer of the equipment selected for at least one week of training. There he will learn not only how to operate the equipment but the use of the proper compounds and abrasives required for his work. He will also learn basic techniques and many tricks of the trade which will enable him to produce better results.

Some companies feel that they can't spare a key man for such training. They lose sight of the fact that without it he must feel his way for many months. He can learn only by trial and error which not only slows up production but runs the danger of ruining more than one load of critical parts.

The same man should also be given the opportunity to visit neighboring plants which are known to do good barrel finishing. Seeing their operations and talking with their key barrel finishing personnel will pay big dividends.

Laying Out the Department

As is the case in other operations, the proper layout of the Barrel Finishing Department can add greatly to its efficiency.

Pitch of Floor and Drainage

The floor is the first consideration. Modern techniques require the use of large quantities of water which must be quickly disposed of. As some kind of soap or other compound is usually present and tends to make floors slippery, the floor should be laid so as to keep the water away from the walking area as much as possible.

To accomplish both, drains are now laid along the walls and floors are pitched to them. A pitch of 1/8" per foot is minimum and a pitch of 1/4" per foot is ideal.

The drain is a concrete trough about 12" wide and 3 to 6" deep at the shallow end, running the length of the room and covered by removable strips of perforated metal. It, also, is pitched at about 1/4" per foot to the outlet. This should be built in the nature of a sump, with the end of the drain pipe raised about 2" above the bottom. The pipe itself should be at least 4" in diameter.

This sump, in turn, is divided from the drain trough by baffles rising about 2" above the bottom of the trough. These prevent stones from being washed into the sump and help to hold back the fines of the abrasive.

Both the trough and the sump must have removable covers to permit periodic removal of fines.

The surface of the floor should not be trowelled smooth but should be left slightly rough so as to provide sure footing for the operators.

PART NO. 67432 NAME OF PART Motor Spacer

OPER. NO. 12 DESCRIPTION Deburr all edges, refine surface and burnish

NORMAL LOAD 10,000 (175 lbs.) CYCLE SET BY

OPERATION		MEDIA TYPE & SIZE	MINIMUM TIME	SPEED R.P.M.	MACHINE USED	COMPOUND & AMOUNT
DEGREASE	✓	#3 Perfecut	5 min.	22	32 x 32	5 oz. #1
CUT	✓	#3 Perfecut	3 hrs.	22	32 x 32	2 lbs. #680
DESCALE						
BLEACH						
NEUTRALIZE						
BURNISH	✓	#3 Perfecut	40 min.	18	32 x 32	20 oz. #212
SEPARATE	✓					
DRY	✓	Fine Corn Cob	10 min.	12	open end	200 lbs.
OIL	✓					#898

SPECIAL INSTRUCTIONS: After Cutting operation inspect 15 pieces for burrs.

See other side for sketch showing critical points.

Water Supply

Because a plentiful water supply is one of the keys to best results, it should be piped direct to each barrel to save steps and labor time. The final connection is usually through a short piece of hose. The majority of departments operate with cold water only but where hot is available, it speeds up many operations and makes others possible which cannot be accomplished with cold water. Where both are available, they should meet in a mixing valve so that the temperature of the water can be regulated.

Electric Hoist

In all installations, except those confined to bench barrels, an electric hoist is almost essential. Barrel finishing departments can be and are operated without hoists, but these are extremely inefficient. They require hand shovelling of hundreds of pounds of abrasive every time a barrel is loaded and this, alone, defeats many of the economies of the barrel finishing process.

A hoist not only loads barrels in the minimum of time but permits the use of motor driven separating equipment and speeds up all operations.

To be truly efficient the hoist should be arranged as a bridge crane so as to serve the entire area, including separators, chip storage bins, incoming and outgoing work, as well as placing of the equipment itself.

Material Storage

Burnishing and cleaning compounds will be ruined if they get wet and sometimes even if they merely get damp. While they must be handy to the barrels, they should be kept on slightly elevated platforms and away from any direct splash from the barrels.

If any acids are used for bright dipping or other purpose, they should be kept well away from finished work to prevent staining.

Chips can best be stored in Chip Storage Bins which conserve floor space to the greatest possible degree and speed up the operation of changing from one size or type to another.

Parts Storage and Handling

Many an otherwise well planned department is hampered because finished and unfinished parts clog the working space and interfere with operations.

In planning the department, ample space should be allowed for both unfinished and finished work, out of the way of the workmen. Bottlenecks should be avoided. Aisles and doorways should be wide enough to permit easy movement in and out.

Selection of Personnel

The selection of the person responsible for the barrel finishing operation is even more important than the selection of the equipment. A fully equipped barrel finishing department can represent a fairly sizeable investment in money and floor space. This department is potentially able to return this investment many times over in production and labor savings.

But it should be remembered that the equipment, media, compounds, etc. are only tools of the trade and like other tools are useless if not properly used. Someone must be educated in their function and application or the operation will not yield the maximum return.

The Man in Charge

The background of this person need not necessarily have been in tumbling or barrel finishing. Of course, if a person can be found with experience in modern techniques, so much the better. But if his tumbling background has been in sawdust or dry tumbling, his experience will not mean much—in fact, it may be a handicap if he retains his old proportions of parts to media and other ideas.

If an experienced barrel finishing engineer is not available, the ideal background for the person in charge is a diversified experience in manufacturing operations including machining, assembly and inspection. He should know not only how the parts are made, but also their function when assembled. With such a background, he will then be able to see beyond a certain deburring problem, for example, and know whether the tumbling operation will eliminate or benefit some subsequent operation such as polishing or plating and also know the types of abrasive compounds which might be troublesome at some later operation.

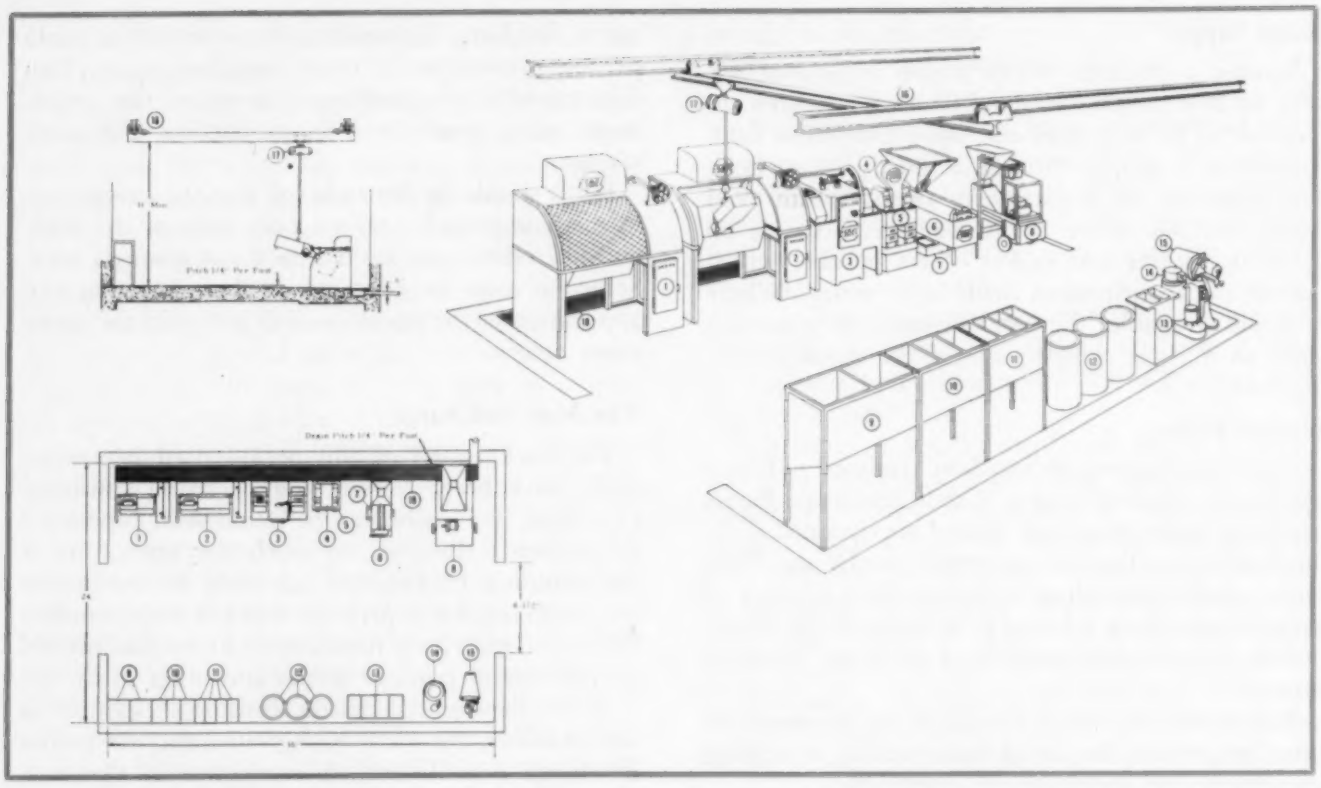
Probably more important than the experience are the psychological characteristics of the barrel finishing engineer. He should possess an intellectual curiosity—the type person who likes to solve puzzles. He will have many problems which can be solved through reasoning and experimenting. However, patience should accompany this curiosity since experiments in barrel finishing consist of trying new approaches or methods and then watching and waiting for answers.

With the many combinations of different media types, media sizes, compounds, speeds, water levels, etc. and the length of time required to run each test, an impatient man can seldom be successful in this field.

If inexperienced, the man chosen can acquire much initial knowledge from three sources.

1. His discussions with the vendor's representative
2. His reading of available literature
3. His training program at the vendor's plant.

This basic education must then be enlarged by actually working with his own equipment and parts. For this there is no substitute. To be most successful, he should expect to work with his equipment upon occasion.



1 3232-2-V Machine	10 Chip Bin - 3 compartment
2 3248-2-V Machine	11 Chip Bin - 4 compartment
3 ST-24C Machine	12 Compounds
4 BT-65C Machine	13 Rust Proofing Tanks
5 BTB Tumbling Bench	14 Centrifugal Drier
6 Dimensional Separator	15 Sawdust Drying Barrel
7 Hoist Pan	16 Bridge Crane Assembly
8 Magnetic Separator	17 2000 lb. Electric Hoist
9 Chip Bin - 2 compartment	18 Drain

The Operator

If a variety of work is being processed, an operator should not be just a laborer. He must exhibit interest in the work being done and pride in the results. He must have a general knowledge of the theory of the operation to avoid simple mistakes which could be costly. If, for example, the operator forgets to put compound into a load of steel parts, the parts can be pitted beyond salvage, or if he used the wrong size chips and wedging of the media in the parts results, a great deal of labor can be wasted removing these chips.

More skill is needed for good barrel finishing than is apparent to the uninitiated and the operator should not only be considered better than a laborer —his labor grade classification should be studied carefully.

Piece Work vs. Day Work

Because of the nature of the job, barrel finishing operators are generally paid on an hourly basis. Piece work or other incentive systems can be applied whereby the operators are paid for loading, rinsing, dumping and separating. Barrel running time is usually not paid for. During the running time, the operator can be working on the other barrels, screening chips in preparation for another run, etc. This works out very well where there are large volumes of repetitive similar type work. In such instances work, media, etc. can be weighed or otherwise measured to keep the process completely standardized. However, if the work to be processed is extremely varied, problems may arise under an incentive system which are difficult to overcome.

One example is when an operator has an opportunity to combine in one load different parts which are suitable for running together and ultimately gets paid for loading, rinsing, dumping all of them as separate jobs. The problem here is that rates cannot be set in advance for combining these jobs because they normally cannot be expected to be ready for processing at the same time. If he does combine these jobs and they are processed satisfactorily, the work has been done, an economy has been made on compounds, barrel time, etc. and production is speeded up. Everything is satisfactory except that the operator may exceed expectancy for his labor grade. This will cause dissatisfaction somewhere along the line. On the other hand, a day rate system usually does not reward an operator for this type of ingenuity. The decision as to method of paying operator labor can only be made after studying all the facts of a particular installation.

Operating the Department

Job Records

If more than five or six parts are to be barrel finished, it is advisable to set up a record system on the methods used for the various parts. Many parts require a good deal of experimentation and if the parts do not repeat for a while or if a key man changes jobs, the experimentation may have been wasted. The record card, an example of which is shown above contains information pertaining to the size and type media used, the compounds, water level, speed and size of barrel, in addition to the minimum running time. The time is probably best recorded as minimum time and indicates the time the parts can be run before inspection—not a time before the parts can be unloaded. A positive cycle before parts can be dumped usually cannot be given because the machining may be different on a particular piece causing the burr or stock condition to vary, the condition of the media may be different, etc.

Experimentation

When a new job is received upon which experimentation is required before setting up a production run, the person responsible can run his own tests in an experimental size barrel and learn much from that. However, if the part seems to require a media that is not available or if the parts present a unique problem, the wisest thing to do is to send samples to a vendor's laboratory. More and more companies are doing this rather than consume the time of their own engineers and equipment. The vendor's laboratory is constantly exposed to various problems and has a more thorough knowledge of available compounds, abrasives, etc., as well as a wider variety to choose from. If the usual vendor cannot solve the problem, try a different vendor who may have a different approach or different media at his disposal.

Relations with Salesmen

Wherever possible, the person in charge of the operations should be permitted to see all salesmen who specialize in barrel finishing. While this is at first time-consuming, it will not take long to discover which salesmen have something to offer in the way of service or supplies that would be useful to the particular company. Some can be eliminated because of price, poor service, etc., but in a field that is expanding rapidly, it is wise to also see new salesmen who may possibly have something different and better to offer. The experienced salesman is a walking storehouse of information who sees all types of parts and procedures. Often he has seen parts similar to yours done quicker and less expensively and will gladly help you save time and money.

Interdepartment Relations

Barrel finishing departments, especially new ones, often have an educational job to do on their other departments. This occurs first of all because someone in the other departments often has heard of or has had a sad experience with parts processed in the older, cruder methods formerly used in tumbling. These people may have to be re-educated to gain their full cooperation.

In some instances, departments such as burring or polishing, will resent work going into tumbling barrels because this will interfere with their work supply and present problems of keeping their people busy. Some work must be done in the beginning to demonstrate to these people that since barrel finishing is more uniform and less expensive than the methods it replaces, the overall picture must be considered for the benefit of everyone.

On the other hand, barrel finishing should not be over-sold to other departments. Quite often, people unfamiliar with this process come to expect that any burr regardless of size can be removed in a barrel and consequently allow cutters and other tools to go longer before sharpening. This creates abnormal and often impossible problems for the barrel finishing department and can result in the process being abandoned on a particular part and sometimes abandoned altogether. The ideal situation is where all related departments have a realistic knowledge of what barrel finishing can accomplish and how the company will benefit thereby.

In conclusion we would like to summarize a few points which are of greatest significance for those individuals and organizations which are not yet taking advantage of the better quality, lower production costs, greater uniformity, and reduction of rejects made possible by **modern** barrel finishing.

This is a field of rapidly developing techniques. What could not be done last year—or even last month—is now being done to perfection. This results from improvements in equipment, abrasives and compounds as well as better ways of using any one or all of them.

Many plants with old equipment, which have not followed more recent developments, are unable to approach the results secured by their competitors who have modern equipment and use modern techniques.

A surprisingly large number of other firms have been so occupied with other production problems that they have overlooked the truly amazing cost reductions combined with all the other advantages which barrel finishing makes possible.

It is actually true that many plants which now use files, wheels, belts or similar means for finishing can install a complete barrel finishing department and pay for its entire cost in as little as three months.

It is for this reason that an increasing number of plants, from coast to coast, are giving first priority to a re-examination of their entire finishing procedures, are installing modern barrel finishing departments and are releasing skilled labor for other hard to fill jobs. ● ●

By **Edmund Mottershead,** President
Mottershead Associates
Chicago, Ill.

GRINDING safely

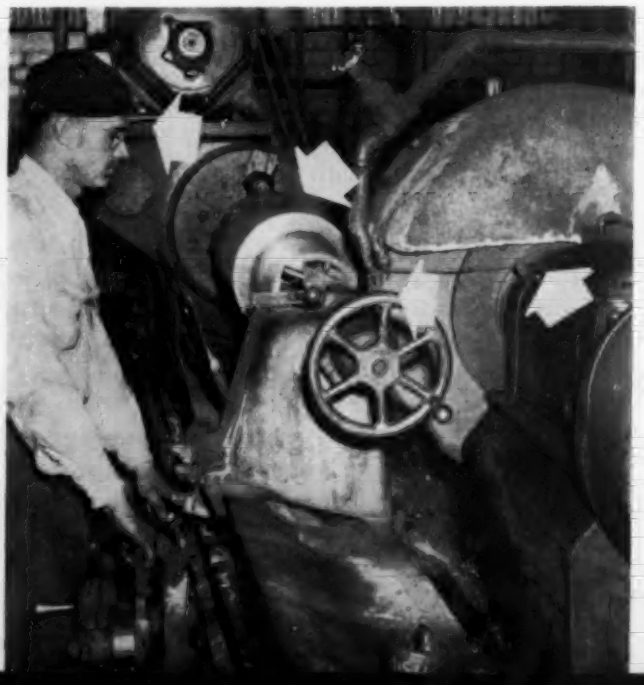
Grinding Wheels Are Safe:

1. DO always handle and store wheels in a careful and proper manner.
2. DO visually inspect all wheels before mounting for possible damage in transit. Use "ring" test too.
3. DO check maximum operating speed marked on wheel against machine speed to keep safe operating speed.
4. DO check mounting flanges for equal and correct diameters. They should be at least 1/3 diameter of wheel and relieved around spindle hole.
5. DO use mounting blotters supplied with wheels.
6. DO be sure work rest is properly adjusted. It should be at center of wheel or above, no more than ⅛ inch away from surface of wheel.
7. DO always use a guard covering at least one-half of the grinding wheel.
8. DO allow newly mounted wheels to run at operating speed with guard in place for at least a minute before grinding.
9. DO always wear approved safety goggles, face shield, or other protective eye saver.
10. DO turn off coolant before stopping wheel to avoid wheel soaking and creating an out-of-balance condition.
11. DO check exhaust system for proper function if one is installed for dry grinding.
12. DO check at start and periodically during grinding for unusual noise or vibration.

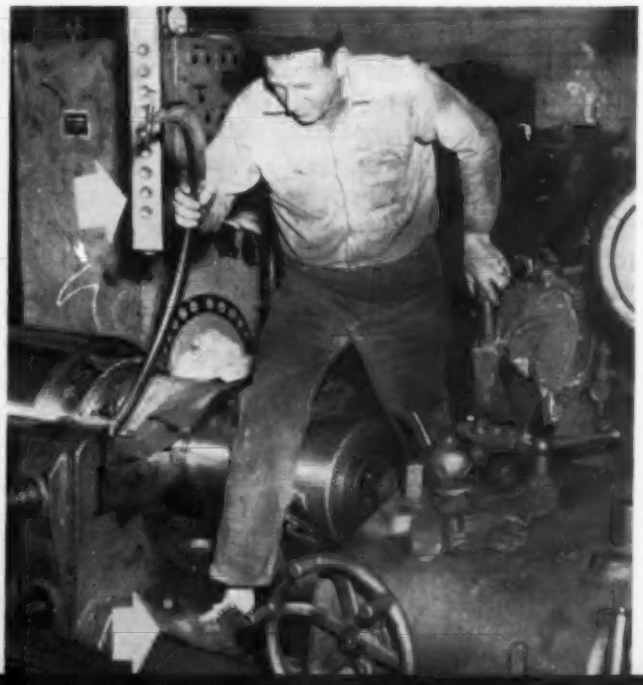
---

1. DON'T use a wheel that has been dropped.
2. DON'T force a wheel onto the machine, or alter the size of the mounting hole. If the wheel won't fit your machine, get a wheel that will.
3. DON'T ever exceed maximum safe operating speed marked on the wheel.
4. DON'T use mounting flanges on which the bearing surfaces are not clean and flat.
5. DON'T tighten the mounting nut excessively.
6. DON'T grind on the side of the wheel unless the wheel is specifically designed for that purpose.
7. DON'T start the machine unless wheel guard is in place.
8. DON'T jam work into the wheel. Don't crowd the wheel. Use moderate, even pressure to avoid straining the wheel and possibly breaking it.
9. DON'T stand directly in front of the wheel when you start up the grinder.
10. DON'T grind material for which the wheel was not designed. Most modern grinding wheels are built for particular kinds of work. Make sure you use the right wheel on the right job.
11. DON'T try dressing or truing the wheel unless you really know how and use a proper dressing tool.
12. DON'T ever guess about what to do in case of trouble. Shut the machine off and ask for help. • •

RIGHT . . . Once grinding wheel is properly selected for size and grit, well balanced in the machine, and once the roll itself has been adequately centered, safety is built-in with the operation. Operators can get by with safety glasses instead of goggles. Operator has wheel revolving and coolant flowing before making his pass.



WRONG . . . Some can always make the easiest jobs difficult and find hazards in a situation where none really exist. Getting caught with a twenty-ton roll turning at a leisurely 85 s.f.p.m. can be very unpleasant. One slip and even his balancing stick, a costly precision instrument, won't prevent him from getting badly hurt. We do not approve of these shenanigans.



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A FEW SCENES FROM THE BEHR-MANNING COLOR AND SOUND MOTION PICTURE

Contour polishing fluted areas of bits on a 1/2" free-running abrasive belt.

Removing weld bead on tubing with a free-running abrasive belt.

Mirrors for boroscopes are being shaped on this wet abrasive belt grinder.

G-12

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Q. What's new in grinding?

A. B-11 resinoid-bonded wheels —for many grinding jobs

Q. What's new about B-11 wheels?

A. Their great new resinoid bond, improved uniformity and balance, new "TOUCH of GOLD" performance-benefits

Q. What is the B-11 bond?

A. It's the latest Norton resinoid bond. Wheels made with it are excellent for snagging, disc grinding, heavy weld grinding, thread grinding, cam grinding, centerless grinding, roll and surface grinding.

Q. Why?

A. Because B-11 wheels are more uniform in structure, with better balance. As a result, they grind cooler and faster. And on portable machines they "hug that work" closer, with less vibration and bounce.

Q. What about those "Touch of Gold" benefits?

A. They're the direct result of the B-11 wheels' more efficient grinding action. In precision grinding this means improved surface finish, greater accuracy, more pieces per dressing. In rough grinding it means less operator-fatigue and longer wheel life. All these benefits add up to more profitable grinding for you.

Q. Any other advantages of B-11 wheels?

A. Many others. For example you get closest possible duplication. Hardness increments are evenly spaced throughout the entire grade scale. And B-11 wheels can be supplied in half-grade increments, making it even easier for you to choose exactly the right wheel for every job.

Q. Sounds fine — what about more information?

A. Your Norton Distributor will gladly give you the whole story on the new B-11 wheels. Or write us direct. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

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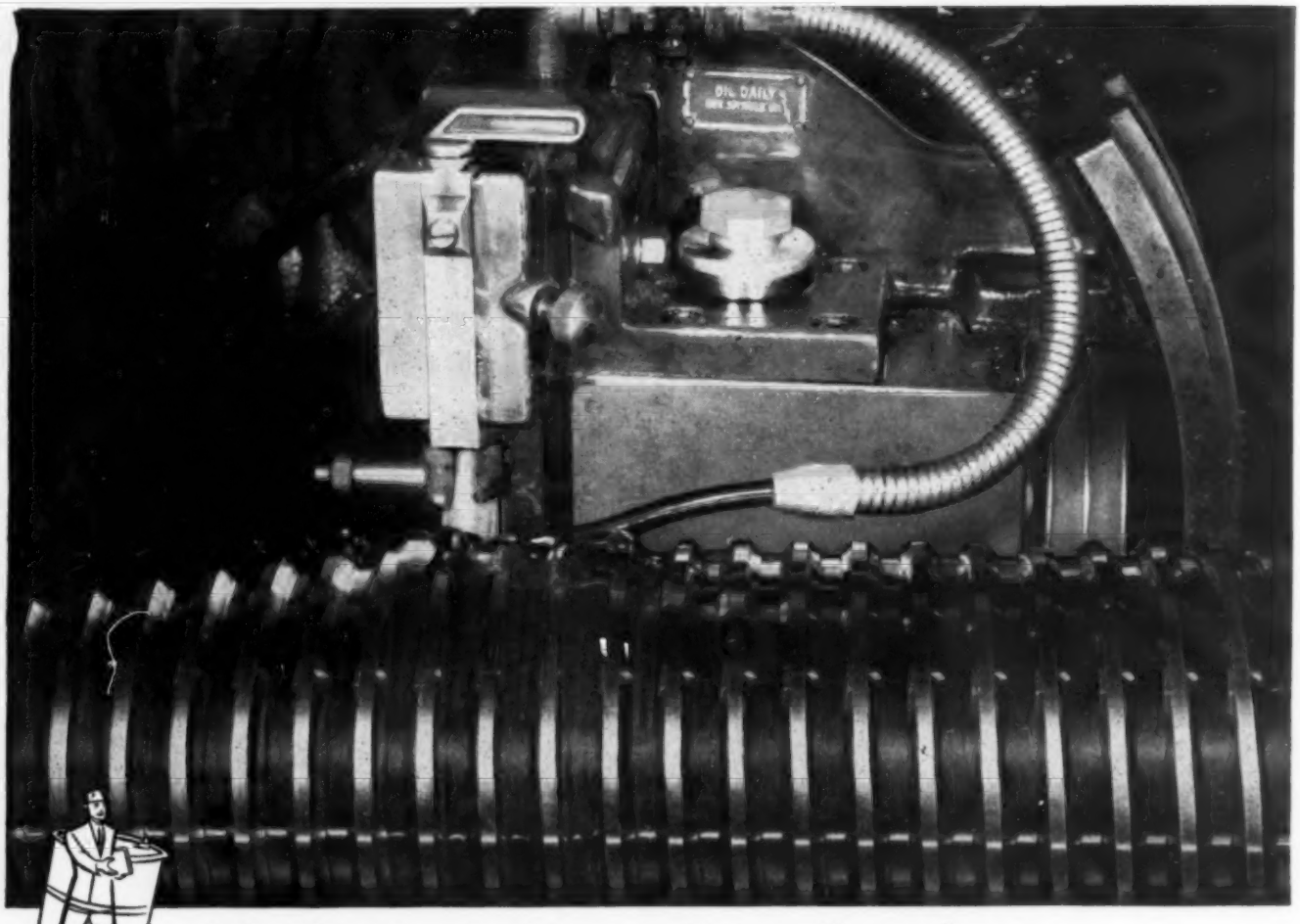

Ask "the Man in the Barrel" to tell you how . . .

A Grinding Oil can *make* or *break* precision grinding jobs!

If you're using *just a coolant* or any oil that happens to be handy for those precision grinding jobs . . . it's costing you money!

A grinding oil can make or break a precision grinding job such as thread grinding, gear grinding and many types of form grinding. Grinding oils are usually classified as "hard-acting" or "soft-acting" depending on how they affect grinding wheel hardness. Grinding oil characteristics must be closely co-ordinated with wheel characteristics, speeds, feeds, and material machinability and hardness to obtain maximum performance.

When form grinding low hardness materials, where wheel form is important, a "hard-acting" oil helps to maintain proper wheel form by making the wheel act harder. As a result, greater wheel life is obtained and more accurate parts are produced.

When a high hardness material is being ground there is a tendency for the wheel to load-up and glaze. Such a condition is the cause of burnt work surfaces and heat checks, and is often encountered when grinding taps, gauges and other hardened parts. A "soft-acting" grinding oil will make the wheel act softer, opening up the wheel and exposing new abrasive grains to do the work.

Stuart's complete line of grinding oils have been chemically balanced and scientifically tested to meet the demands of various types of precision grinding operations. "The Man in the Barrel," your trained Stuart Representative, will be happy to assist you in selecting the proper grinding oil for your particular needs. Ask to have him call . . . and ask for a Stuart's Precision Grinding Oil Bulletin, too.

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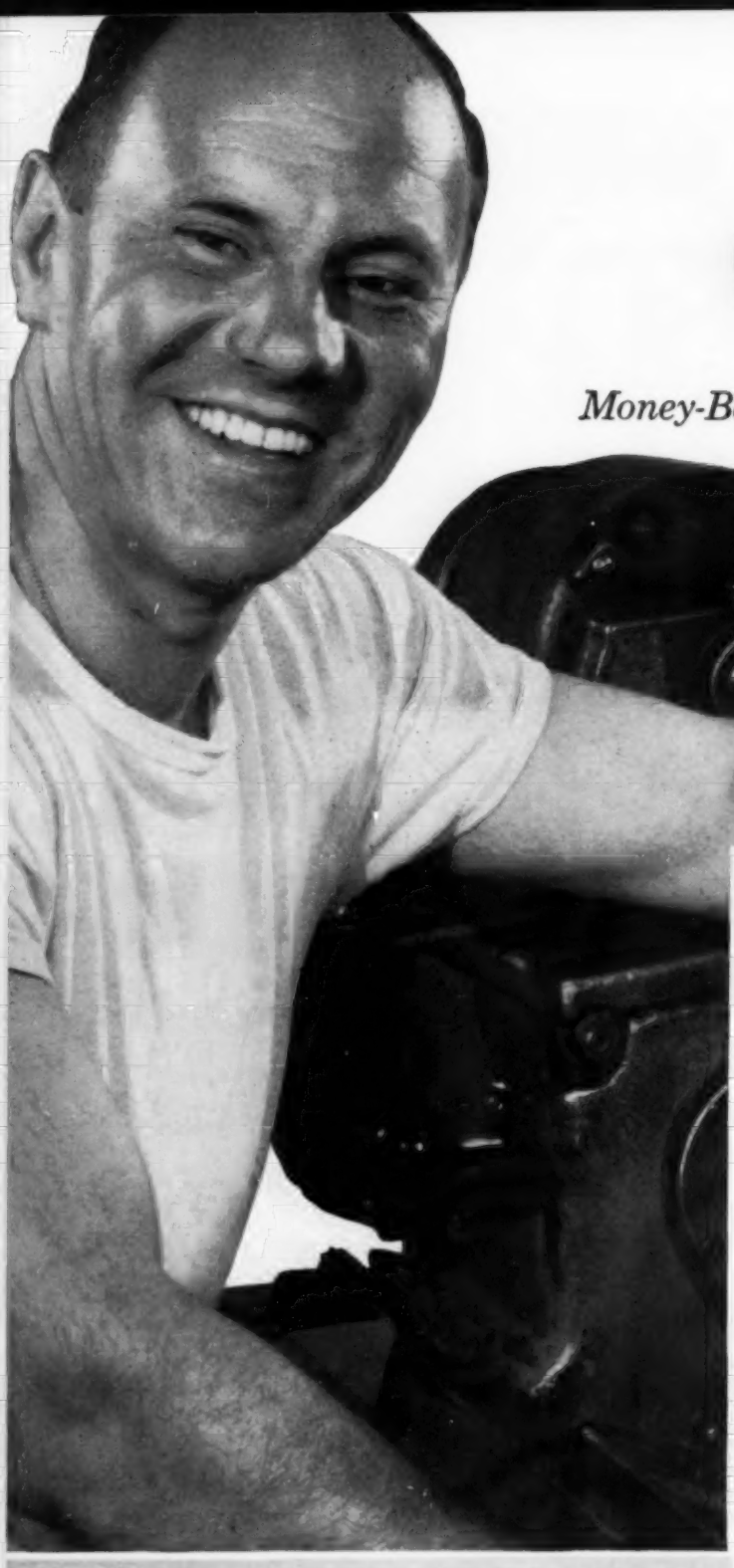
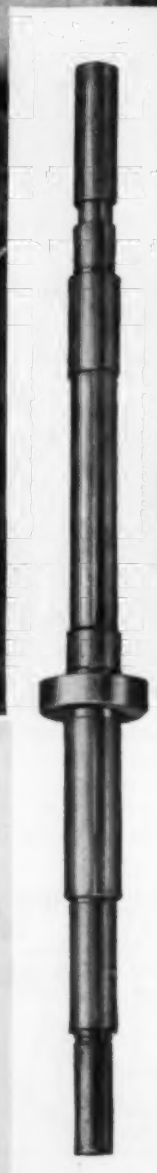




PROBLEM: Produce motor shafts to critical dimensions out of tough stainless steel. Because the shaft is long and thin, the coolant must minimize grinding wheel pressures to help overcome the natural "whipping" motion of the long part.

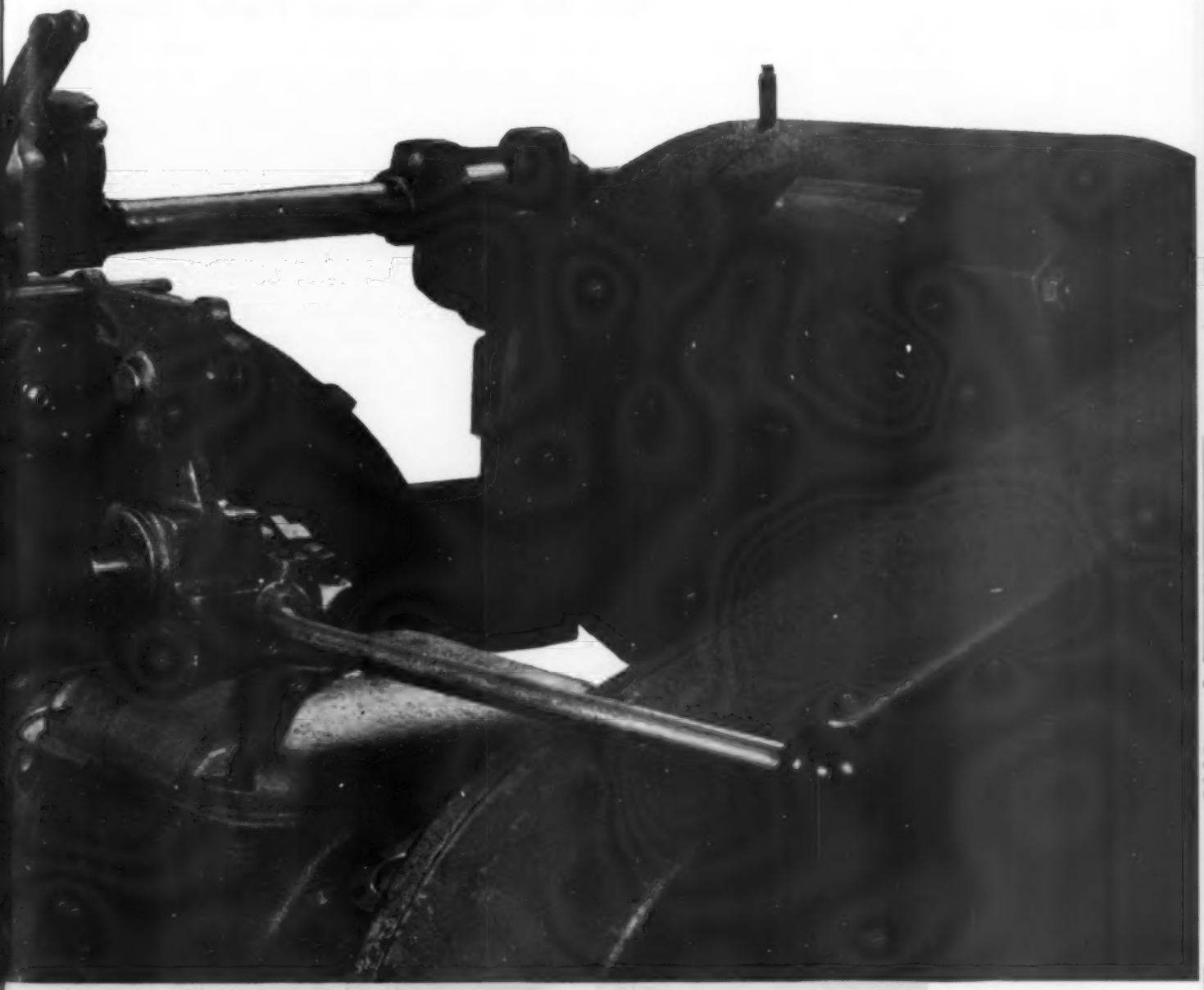
SOLUTION: Johnson's Wax-Cool, the water-soluble coolant with the money-back guarantee.

Yes, it takes superior Johnson's Wax-Cool to do this difficult grinding job. Wax-Cool's unusual lubricity and cooling ability eliminate high grinding pressures to permit the wheel to grind according to grade and help to eliminate both deflection and heat distortion. Wax-Cool also keeps wheels free-cutting to produce cooler parts with mirror-like finishes.

If Wax-Cool can do *this* difficult grinding job, think of the many ways it can help you in your shop.

PRODUCTS OF JOHNSON'S WAX

Johnson's Wax-Cool to stainless shafts!



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There's Money in Your Sludge . . .

New Dust Trap Recovers Wasted Diamonds

By **Dick Bush,** Assistant Editor

- √ $3½ million worth of diamonds recovered each year
- √ more and more users reclaim diamonds
- √ diamonds hopelessly lost if central dust system is used
- √ new dust trap operates on oil bath principle
- √ takes up very little floor space
- √ needs no rearranging of machines
- √ low in cost

INDUSTRIAL diamond reclaiming came of age during the severe diamond shortage caused by the Korean War when reclaimers salvaged for re-use about a million carats of diamond powder valued at over 3-½ million dollars each year. Factory management found the big dollars and cents returns from diamond salvage to be such good business that reclaiming has become an established service which is expanding and improving all the time.

Tungsten carbide grinding with diamond wheels is done with a full flow coolant, drip wet coolant, or dry. The most efficient use of diamond wheels is obtained with a full flow coolant and the diamond can be salvaged from the sludge that accumulates in the coolant tanks. Reclaimers supply filter bags which are used to collect the sludge from the coolant while a diamond wheel is being used and removed if an abrasive wheel is used on the same machine. This segregates diamond sludge from other miscellaneous abrasives in the sludges and many times makes the difference between a valuable sludge and a worthless one. Below certain limits of diamond concentration it does not pay the reclaimer to spend valuable skilled time and expensive materials on sludges which will not repay that time plus a return to the owner of the sludge. In general, a sludge should contain at least 2 carats per pound to make it worthwhile.

A unit without by-pass, showing also cleanout donut section of filter

A unit with by-pass showing also the mounting bracket.

Many grinding jobs not not adapt themselves readily to full flow coolant and must be done with drip wetting, or dry. This type of grinding while giving a less efficient use of diamond wheels yields a swarf that has a high content of salvagable diamond if it can be segregated properly. Most shops and tool rooms have efficient dust collection systems to carry away the swarf from dry and drip grinding operations into a central dust collection system. With this arrangement the little diamond particles are lost in literally tons of grindings from many different operations. Realizing the value of segregating diamond swarfs for salvage some factories set up separate machines for exclusive diamond grinding with separate self contained dust collectors. Such an installation while profitable was not always practicable due to the necessity of rearranging the shop, the shop practice, using some extra floor space for the dust collector, and the extra expense of the dust collector which might be $500 to $1000. In addition, there is always the question of such an outlay in any unproved collecting location.

With this in mind the National Diochemical Co., Chicago, developed a DI-SAVER (Trade Mark). It is an efficient diamond dust trap which operates on an oil bath principle and uses a steel filter bed. It can handle 375 CFM of air. The unit is installed in the central dust collection system duct at the diamond grinder and effectively isolates the swarf from the grinder to make it valuable for recovery of diamond. Figure 1 shows the DI-SAVER with an internal by-pass for use in ducts where alternately both diamond and abrasive dusts may pass. This is necessary because even in roughing operations the same machine may generate enough abrasive dust to materially lower the diamond value of the swarf. Figure 2 shows the DI-SAVER without by-pass for use on exclusive diamond grinding operations.

The value of the intermediate dust trap—such as the DI-SAVER—besides the low initial cost of under $100, is that it takes up little or no extra floor space. It does not require any rearrangement of the tool room itself or of tool room practices except for the flip of the lever when the operator changes from diamond to abrasive wheels. It is also necessary to remove the loot from the trap from time to time. This is a simple operation in which the thumb screw is loosened to allow the bottom oil container to drop down and be removed. The sludge and oil is poured into a 3 or 5 gallon can and new oil added to the marked level in the oil container. After the sludge has been allowed to settle for a week or more the oil can be poured off and reused for the next filling. The accumulated sludges are sent directly to the reclaimer without any further treatment in the factory. While the oil pan is off the bottom, the filter section is inspected and if it seems excessively clogged the donut section is removed by loosening its two thumb nuts and washed out in the filter oil, or if necessary, a lighter weight oil.

It has been estimated by some users that the installation of a trap can in some cases pay for a new grinder in five years. Nowhere can management get so much for so little as in a complete diamond salvage program. • •

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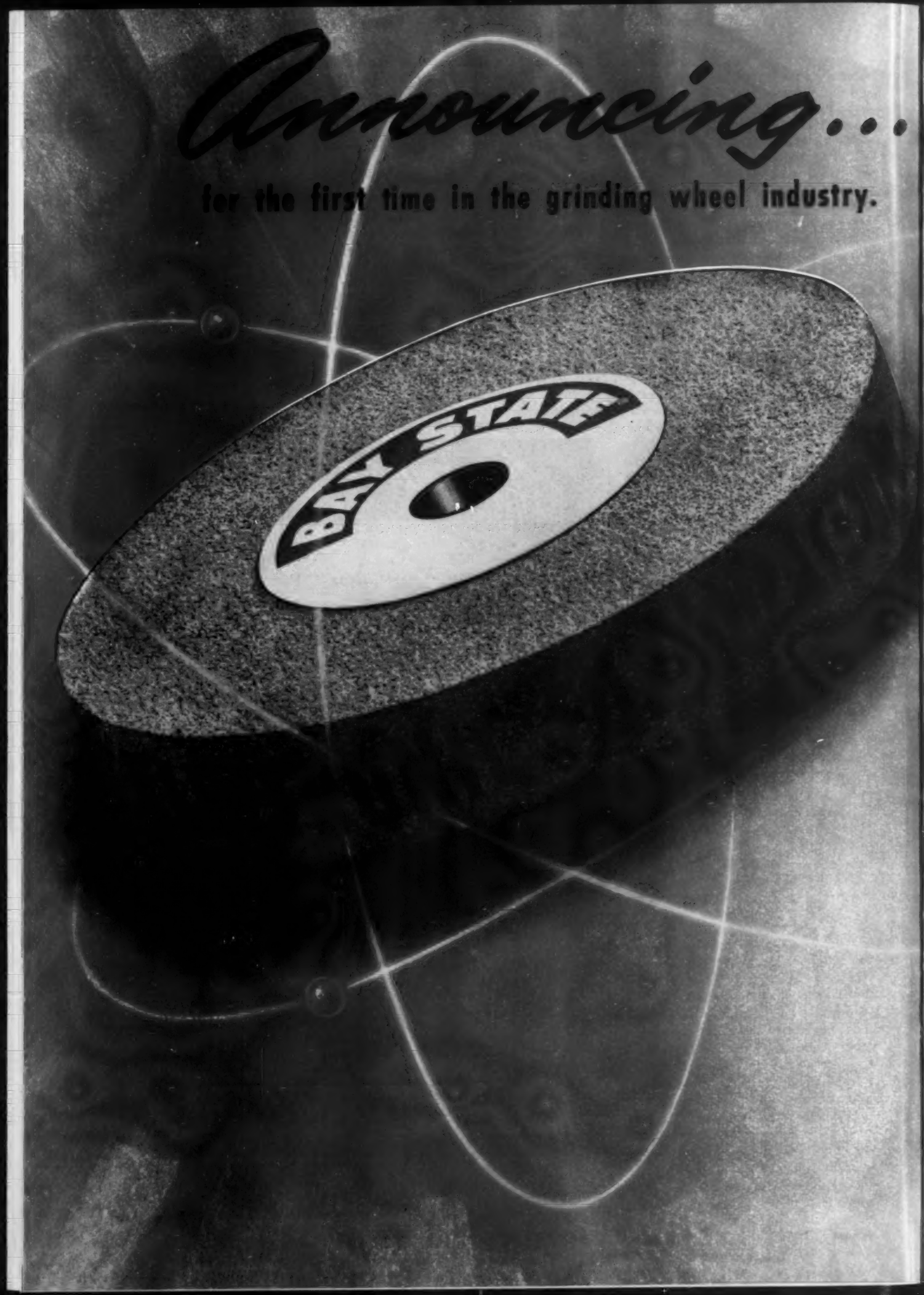
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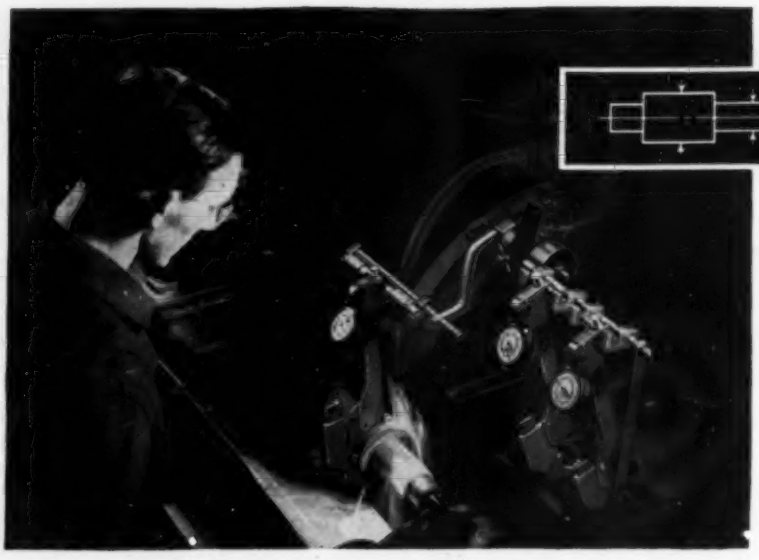

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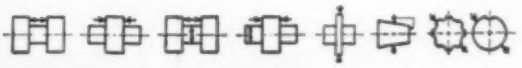
one or several diameters on same set-up

Faster than snap gages and more accurate, too. No stopping grinder to gage. You see the diameter of the work all the time *as it grinds.* Various gage setups available (see below). Overgrinding is eliminated. Less scrap. No grinder should be without this gage.



Any of these dimensional requirements, and more, can be gaged with simple gage set-ups to suit.

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The Arnoldair smooths out the vibration and reading oscillations. Users report they can split tenths easily and repeatedly. Gives the operator even greater assurance of accuracy and increases his production. Illustration shows two-dimension Arnoldair applied with Federal Dual Dimensionair.

also applied to

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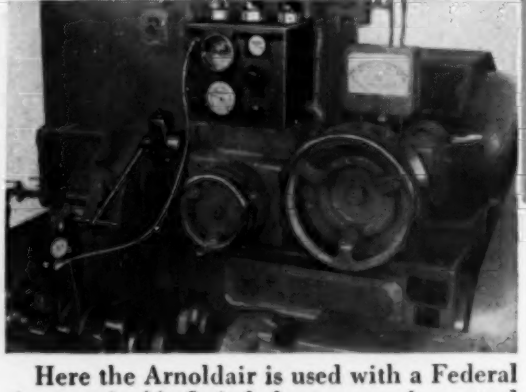

Here the Arnoldair is used with a Federal Automatic Air Switch for automatic control of grinding machine.

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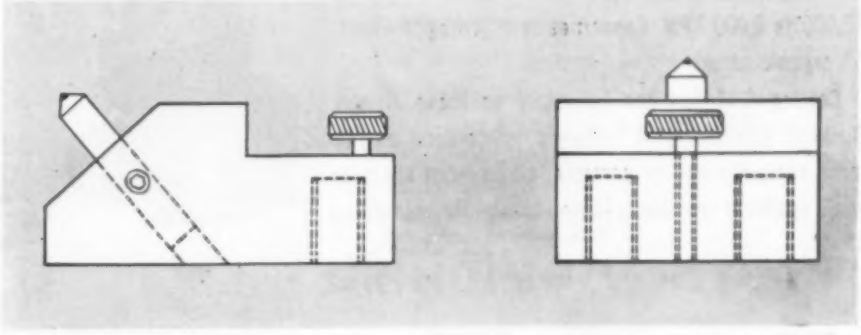
Shop Hints and Short Cuts

A Wheel Dressing Tool

By **Harry Koslow**

When grinding a die or other piece of work on the surface grinder it is sometimes necessary to redress the wheel before the job is completed. This may be to remove the glaze or to produce a sharp corner on the wheel. If there is no room on the chuck for the dressing tool the work must be removed to permit dressing of the wheel. This means cleaning the chuck and the work and perhaps indicating the work when it is returned to the magnetic chuck. To avoid these operations we made up a number of magnetic diamond holders. They consist of a steel block beveled off and drilled to take the diamond in the usual way. In addition, the back end is stepped off as shown and two blind holes are drilled. A brass bushing is pressed into each hole and into each bushing a permanent magnet is pressed as shown. The magnets are placed in opposite positions, that is one with the North pole up and the other with the North pole down. A knurled screw between the magnets serves to "break" the magnetic grip when it is turned down against the work. The back end of the block is stepped down so this release screw will be clear of the wheel. This dressing tool can be placed directly on the work. When the magnetic chuck is removed to permit the grinding of large work the dressing tool can be used on the work or on the table of the grinder.

This tool is very inexpensive and simple to make yet is very handy to have around. • •



Do you use short cuts in your work? Do you have any kinks which would be helpful to the next fellow? Send them to GRINDING and FINISHING for publication. All material is paid for! Material can be in your own words, drawings can be rough pencil sketches; our editorial and art departments will do the rest. Send your Hints and Kinks to: Editor, GRINDING and FINISHING, 222 E. Willow Ave., Wheaton, Ill.

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and this ALL-NEW power-packed grinder— weighs just 4½ lbs.!

You'll look a long while before you'll find a grinding job that can't be handled by one of these NEW Buckeye horizontal grinders! Plenty of power to handle a 6" wheel on heavy work . . . can be used with roll-type abrasives or wire brush, and will do a top-notch job with either . . . can even be used with a tool post holder for accurate work.

You'll like the built-in muffler that cuts down exhaust noise, yet has no external parts to add to tool diameter. You can adjust the exhaust deflector to any position in a full 360° circle. Steel case encloses tool at largest diameter, provides added protection, insures longer wear.

Maintenance on this tool is amazingly simple. Tool can be disassembled without any special tools, and all working parts are readily accessible for checking and servicing when necessary. Available in four speeds, 15,000 to 6,000 RPM. Capacities to 4" vitreous wheel, 6" organic wheel.

Catalog G-10 has the full story on these all-new Buckeye grinders, plus complete information on the most complete line of portable, air-powered abrasive tools available anywhere. Write—today—for your copy.

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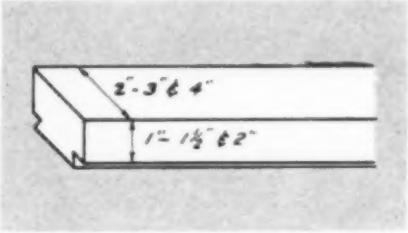
Save Time, Cut Costs, Improve Service

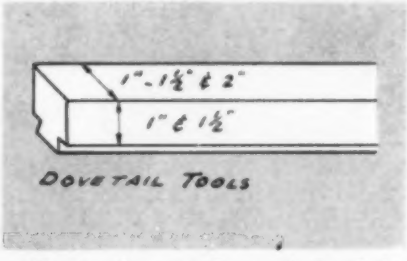
By A. E. Salmons

Many people do not like grinding or are afraid of it. The average toolmaker or machinist will grind his own tool bits on the hand grinder or he will take a finish cut for accuracy on the surface grinder. Anything else he will do on the miller even though it may take twice as long. Yet the grinding machine with the proper wheels and guards is as safe as any miller, shaper, lathe or drill press. I have seen toolmakers take off 1/16 from flat stock on the miller. They had to install vise, line up work, install cutter and start removal of stock. They could have done this same job in half the time on the surface grinder. It's a fact that you can do a lot of grinding in the time it takes to set up a miller, especially flat stock. Many similar jobs such as slots, grooves, steps and dovetails could be done on the surface grinder. In addition you have the advantage of a better finish with far greater accuracy.



Many tools, jigs, fixtures have to be finish ground on the surface grinder, so if the stock removal is not too great you save time by eliminating one setup. In our shop we make automatic dovetail tools of the following sizes.

They are made from high speed bar stock. They are shaped, dovetails milled in them, hardened and finally cut off into standard lengths. When these dovetails break in operation or when they are worn out we make them into smaller tools as shown.



We simply cut off or grind off the old dovetail and grind in a new one. It is a quick, accurate method. It cuts costs, improves service and saves time. The milling, shaping and hardening are eliminated. No high speed steel is discarded as we make still smaller tools from smaller tools. Very often the old width becomes the new depth. With the cost of high speed steel we can realize a large saving in a year's time. •

Copper "Button" Laps

By **H. J. Gerber**

In the lapping of small flat surfaces on the lapping plate there is a tendency to develop a slight "crown" or high spot through the middle of the lapped area. For the purpose of lapping off this crown I use small button laps turned from copper bar stock. The small lap enables one to lap only a restricted area which has tested out to be high. This is often the case in the lapping of snap gages and the small laps are invaluable for this purpose.

The laps are turned and carefully faced on the lathe and may even be ground on the surface grinder by attaching them to the magnetic chuck with the pressure sensitive tape, gummed on both sides, now commonly available.

A small hole is drilled in the center of the round lap for the purpose of manipulating the lap with the illustrated handle. This handle was devised by simple modification of a discarded screw driver. The end of the cut-off shank was ground down in diameter to make a loose fit in the hole in the lap. This will allow the lap to rotate as it is worked over the surface. This rotation serves to equalize wear on the lap.

These laps, made in various diameters, will many times prove very useful on high precision "touch up" jobs on small tool items. •

We buy surplus diamond wheels and tools, also diamond wheel stubs and sludges. Highest prices paid.

NATIONAL DIOCHEMICAL COMPANY
3108 W. LAKE ST. CHICAGO 12, ILL.

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16 PRESIDENTS AGO!

we started business

We started business when Grant was President of the United States.

Thru major wars, depressions, recessions, panics, floods, and political upsets we have served industry with the very best in grinding wheels.

You've got to be good to set up a record like that!

Write for details or the name of your nearest distributor.

DAYTON SAFETY GRINDING WHEELS

SIMONDS WORDEN WHITE COMPANY

1101 Negley Place • Dayton 7, Ohio

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Letters to the Editor

Information, Please

We are interested in finding a manufacturer of abrasives that can supply a flexible strip.

Any suggestions as to whom we should contact would be appreciated.

L. B. Miller
L. B. Miller Co.

Having read article 1 on centerless grinding in December issue of GRINDING and FINISHING would like to know of anyone in our area or the closest source of this type of grinding and centerless lapping.

H. A. Angus, Mfg. Supt.
Engineered Prods. Co.
Flint, Mich.

Any information you may have on either of the above will be greatly appreciated.

On page 97 of the August 1955 issue of "Grinding and Finishing" mention was made of the Anocut Engineering Co. Would you please furnish us the address of this company in order that we may obtain from them additional information on their equipment for electrolytic grinding.

R. S. Reichart
Eastman Kodak Co.

In your November, 1955, issue of Grinding and Finishing you have an article on finishing and grinding stainless steel on page 10. The dressing referred to in setting up wheels on page 14 indicates that the best known compounds are Butler, Reliance and Lea, which generally come in stick form.

We are interested in finding the manufacturers or distributors of the above referred to compounds and would appreciate that information.

Wm. Hungate
Universal Products, Inc.

Please be advised that we are interested in obtaining the source of manufacture of Semi & Fully Automatic Grinding, Polishing and Buffing Equipment.

For your further information and guidance, we are particularly interested in equipment that will economically handle various types of metals and shapes that are produced either by the cast or spinning method.

P. H. March,
Purchasing Agent
Kurt Versen Co.

Information sent.

Standard Data

I have enjoyed the articles by Mr. E. A. Cyrol in your magazine "Grinding & Finishing" very much.

I would appreciate tear sheets of the four articles published to date if they are available.

What is the price of the booklet on the articles by Mr. Nissley published in "Machine & Tool Blue Book"? I have seen notice of it in several places, but no price tag or available date.

Gene Babcock
The Challenge
Machinery Co.

Practical Time Study by Harold R. Nissley is available at $1.00 per copy.

Precision Barrel Finishing

A copy of your publication, Grinding and Finishing, for October has come to my attention.

The series of articles by Shipley and Biebel of Tumbling Sales and Service Company holds considerable interest for us at this time. We would like to receive tear sheets of this series of articles from the September, October, November and succeeding issues to complete the file on this subject.

A. L. Shields, Mgr.
Materials & Process Eng.
Westinghouse Electric Corp.

We have your October issue of "Grinding and Finishing" and have read with interest your article on Precision Barrel Finishing, which happens to be the second part of the total article. Would you please send us a copy of the first part. We would also appreciate obtaining any future copies of the magazine which will contain articles on this subject.

L. T. Briggs, Jr.,
Gen. Mgr.
Erie Plating Co.

We note with interest your five part series entitled Precision Barrel Finishing . . .

We are wondering if you are going to have a combination special report of this series of articles for distribution. We would appreciate receiving several copies of this series of articles.

C. H. Castle,
Technical Director
Roto-Finish Co.

The series on Precision Barrel Finishing ends in this issue. Reprints will be available some time in February.

"Who-When" Cards

Upon reading your article entitled "Who, If Not You? When, If Not Now?" in the December issue of GRINDING and FINISHING, I would like two of the cards of which you talked.

D. E. Waite
Director of Technical Service
Armour & Co.,
Coated Abrasives Div.

I enjoyed the article very much that appeared on the Editor's Page of the December, 1955, issue of GRINDING and FINISHING and would like to receive one of the cards that you offered to send.

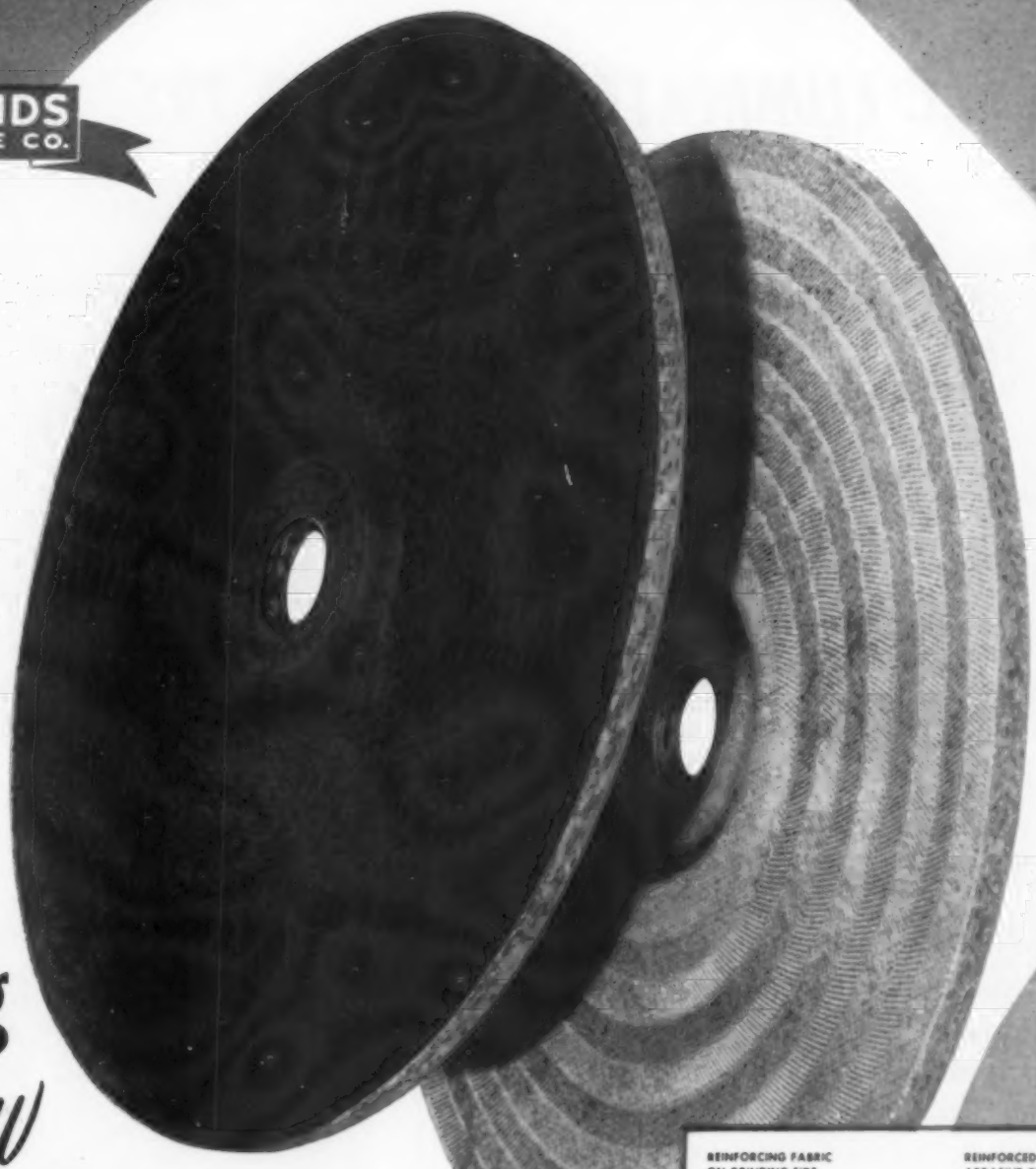
Alvin L. Maring,
Prod. Engineer
Muskegon Piston Ring Co.

Please send me sign you mention in your publication which reads: "Who, if not you? When, if not now?"

C. W. Thorn, P. A.
Hallmor, Inc.

Cards have been sent. We shall be happy to send them to anyone requesting them.

SIMONDS ABRASIVE CO.



new

extra strong with *new* SAFETY FEATURES

SIMEX® RED WHEEL

REINFORCING FABRIC ON GRINDING SIDE
REINFORCED RESINOID BONDI ABRASIVE CUTTING PARTICLE AND FIBERS
SPIRAL SAFE WEB BACKIN (AUTO TIRE CO CONSTRUCTIO
GRINDING EDGE

for production grinding, weld grinding, cleaning-up

Structurally different

Lightweight, rigid and reinforced resinoid bonded, this new faster cutting abrasive wheel, stands up safely to any directional stress. Wheel mass is reinforced throughout with thousands of alpha cellulose fibers. Top side has extra safety web backing of spiral wound rayon auto tire cord. Grinding side has knurled pattern for extra cutting speed and fiber layer for added strength.

SEND FOR BULLETIN ESA-244

SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.

Branch Warehouses: Boston, Detroit, Chicago, Portland, San Francisco. Distributors in Principal Cities

Division of Simonds Saw and Steel Co., Fitchburg, Mass.

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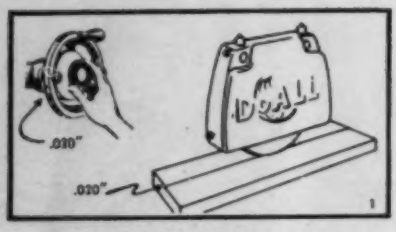
Extra Savings FROM YOUR SIMONDS DISTRIBUTOR'S STOCK • SERVICE • KNOW-HOW

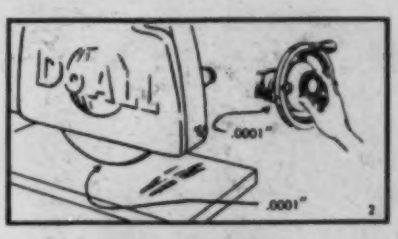
DoALL ELIMINATES "CUT AND TRY" GRINDING

Can Your Grinder Meet The Test?



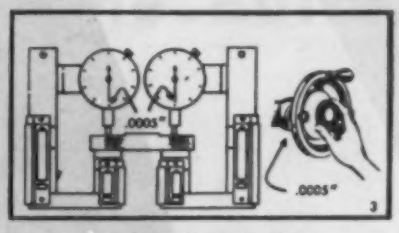
NO SPARK-OUT

1. Take a .020" cut with .020" crossfeed in 59-60 RC tool steel. A DoALL Grinder will run back through the cut with absolutely no spark-out!



ERASE PENCIL MARK

2. Now, put a pencil mark across the cut. Feed down .0001" and run the wheel through the cut again. A DoALL Grinder will erase the pencil mark!



DUPLICATE DIMENSION

3. Downfeed .0005" and grind ⅛ the width of the workpiece. Do the same to the opposite ⅛ of the surface. Both cuts will check out at .0005" when done on a DoALL!

WHAT FEED SETTING SAYS— DoALL GRINDER DOES!

If the downfeed calibrations of your grinder do not represent an equivalent amount of stock removal, then you are paying a premium for the work it performs. It is a costly waste of time to grind, and measure, then grind and measure repeatedly, to reach a desired dimension. Try the above test on your grinder. Then ask to see the same test on a DoALL Grinder. You'll see why grinding time on a DoALL is productive time!

Free demonstrations—Here you see men who had never before operated a grinder, remove stock exactly to downfeed settings by following simple instructions. Call your nearest local DoALL Store or write The DoALL Company, Des Plaines, Ill., for a free demonstration. Let DoALL grinder performance speak for itself.

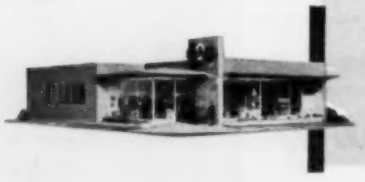
Free literature—Ask for the DoALL Grinder Catalog describing a complete line of hydraulically operated manual or automatic precision surface grinders with modifications and accessories for flat, cylindrical and form grinding work. Write or call DoALL today.

Friendly DoALL Stores in 38 cities. Personalized service, complete stocks, local delivery.

DoALL

NEW FILMS: Color . . . Sound . . . Analysis "Techniques of Surface Grinding" and "Extending the Range of Modern Surface Grinding."

GR-15



MACHINE TOOLS ..... CUTTING TOOLS ..... GAGES ..... GRANITE PLATES ..... TOOL STEEL

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After the cemented wheels have been cured, they are aged in a drying oven for two days.

Each valve grinding wheel is individually dressed to shape, then packaged for shipment.

Epoxy Adhesive Reduces Grinding Wheel Rejects

Tiffin, Ohio . . . Concentricity, important with any type of abrasive wheel, is an absolute must in the case of valve seat grinding wheels. The vitrified wheel must be securely bonded to an aluminum insert, exactly on center and without the slightest warpage. This can be quite a problem, particularly so because the machined metal insert has to be very thin.

The Sterling Grinding Wheel Company of Tiffin, Ohio, has found that the choice of adhesive used to cement wheel and insert to each other is of major consequence. Whereas in the past the company had been using a resinoid cement formulation, the production department has found that an Epon* resin based adhesive yields far superior results. First, the epoxy adhesive has a much higher bond strength, so that even under exceptionally heavy loads the wheel and insert will not separate. Second, use of the epoxy adhesive has eliminated the problem of warpage of the insert which was encountered when the resinoid cement was used. Such warpage necessitated excessive dressing of the wheel and, in some cases, rejection of the finished product.

The epoxy adhesive, supplied by the Armstrong Products Company (Warsaw, Indiana), comes in two separate components, the adhesive base and an activator. Mixed in the proper proportion, the adhesive has a pot life of about half an hour; therefore, no more than can be used up in that time should be prepared.

When used, the adhesive is applied to the outside of the insert as well as to the inside of the wheel itself. An arbor press forces the two components together to assure a snug, concentric fit. Cemented assemblies, after being cured and later aged in a drying oven for two days, are dressed to the size and angle needed for precision valve grinding. •

*Registered Trade-Mark, Shell Chemical.

To secure the best possible bond, the adhesive is applied to both the insert and the wheel.

New 6" x 18" hand feed

Thompson Grinder

FOR SHOPWORK
OR TOOL ROOM

Completely anti-friction and permanently lubricated machine. Available with all types of attachments found on tool room surface grinders including interchangeable horizontal and vertical wheel heads. A Thompson high quality precision machine at this low price.

PRECISION PETE says:

FOR LOW COST AND QUALITY YOU JUST CAN'T BEAT THOMPSON
Make your next hand feed grinder a Type D Thompson . . . write today for the new descriptive catalog, D-55

* Price F.O.B. Springfield, Ohio U.S.A., Subject to Change Without Notice.

Call, write or wire today

Thompson Grinders

The Thompson Grinder Company at Springfield, Ohio

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80 Ton Abrasive Belt Grinder

Niagara Falls, N.Y. . . . Costing just under a quarter million dollars, this abrasive belt grinding machine was designed by the collaborative engineering efforts of the Farnham Div., Weisner-Rapp Co., Inc. and The Carborundum Co. The machine was built by Farnham in their plant at Buffalo, New York.

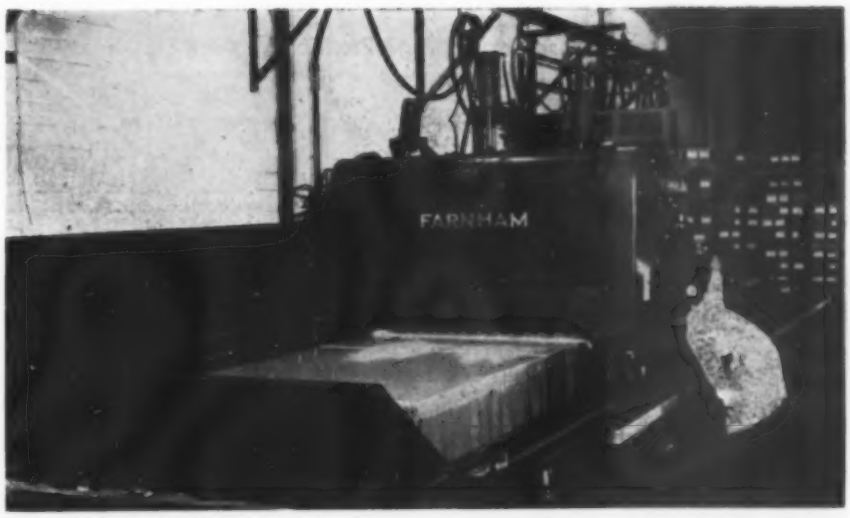
Although the immediate purpose of this giant surface grinder is to taper aircraft wing skins, refinements in the design provide for a wide scope of grinding operations. Carborundum's development program has included many tests that have proved the versatility of this type of machine for grinding aluminum, lead glass blocks, stainless steel castings, boiler plate, and stainless steel sheet material.

The new machine will accommodate work pieces up to 40 feet long by 86 inches wide by 12 inches thick.

One of the unique features of this new abrasive belt surface grinder is the moving head that traverses the entire length of the 40 foot long adjustable table. The moving head mounts an 88 inch wide waterproof abrasive cloth belt, coolant sprays and control mechanisms. The 250 hp head frame mounted motor supplies 3 hp per inch of belt width, a power requirement the Carborundum's abrasive belt engineers find adequate for all present or foreseeable grinding operations.

Another feature that makes this surface grinding machine unique is that a taper may be produced by moving the head vertically as it traverses the length of the work piece which is mounted on the fixed vacuum chuck table. The vertical movement of the grinding head is produced by a precision tracer valve controlled hydraulic system. Two DC gear head motors engage fixed racks to traverse the head. The fixed table design approximately halves floor space requirements when compared to moving table designs of the same capacity.

With this moving head design, tapers are produced by three methods. Simple tapers may be dialed into a unique universal taper mechanism mounted in one column of the head. Complex tapers or surfaces are produced by mounting a master template along the length of the bed ways. In each of these methods, the grinding head move-



The above picture shows the moving head that traverses the entire length of the 40 foot long adjustable table. With this moving head design, tapers are produced by three methods.

Brand New!

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hask AIR Grinder...

most powerful air turbine grinder in its class!

75,000

R.P.M.

(1/5 H.P. prony brake test)

- **Permanently sealed bearings . . . never needs lubrication in air lines or grinder.**
- **Removable nose piece for deep grinding.**
- **Gyro action of turbine holds tool steady.**

Here's power—SUSTAINED POWER—like you've never experienced before in an air grinder . . . power unexceeded by any other air grinder in the same price range . . . **maintains its high-speed efficiency under load!** Built with a lightweight, contoured, hand-fitting aluminum housing, the Haskins **hask AIR** Grinder handles easily, balances perfectly . . . excellent for the most precise grinding job. Complete kit includes: carrying case, adapter hose, mounted points, dressing stone and wrenches.

for Complete details

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HASK-AIR HASK-FLEX

2649 W. Harrison St.
Chicago 12, Illinois

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ment corresponds to the shape of the template or cam to produce the desired shape.

The third tapering method is designed into the fixed vacuum chuck table. Individual table sections, which add greatly to the flexibility of the machine, may be tilted from side to side and locked in place with production shims. This tilting table feature may be combined with either the universal taper mechanism or the master template for the production of compound surfaces.

Precision, a well-known headache in industry, is engineered into this moving head abrasive belt surface grinding machine. Previous experience and initial data indicate that tolerances of plus or minus 0.005 inch can be achieved or bettered. Tapers that can be dialed into the machine range from 0.0001 inch per foot to 0.0750 inch per foot of traverse. The same tolerances are achieved on compound surfaces by accurate machining of the master template.

The wide belt surface grinding machine embodies the related experience of industry to date and overcomes many technical and economic problems encountered in earlier machines. Its moving head cuts floor space in half. The segmental tables add greatly to its versatility. On moving table machines, shimmed adjustments must be made on every setup, whereas, on Carborundum's moving head machine tapers can be dialed in very simply or the conventional shim or master cam method can be used. As compared to milling methods, the relatively inexpensive abrasive belts are easily mounted and removed and offer a wide variety of abrasive grain sizes for stock removal and finishing operations. This is very economical as compared to maintenance costs and setup time on milling machines and planers. Furthermore, the wide abrasive belt presents uniform abrasive action to the entire width of the material being ground—whereas, milling cutters machine a twelve to fourteen inch wide path per pass and leave a surface imperfection that must be removed by an additional grinding operation.

The company has instituted a surface grinding service to explore the possibility of using it for a wide variety of industrial applications. An invitation has been extended to industries that have possible application for this flexible wide belt machine to send sample lots for test runs. A confidential report is made on each test run for the guidance of the affected companies.

The work area is arranged adjacent to a railroad siding for efficient material handling. The complete installation will include, beside the surface grinder, equipment for handling and trimming. Rigid inspection before shipment will insure that surface finish and dimensions are according to specifications.

• •

Capacity Increased at Electro Refractories

Electro Refractories & Abrasives Corp., of Buffalo, has increased the capacity of its crucible mix department by 25 per cent to meet growing demand for crucibles.

The increased production facilities feature a different type of mixing action using steam jacketed mixers for better heat control. This makes it possible to get more crucibles from a single batch.

With the new additions the company will be able to make crucibles of 1,000 pounds or more in one batch, believed to be the biggest in the industry.

Here's NEW VERSATILITY

● **MEASURES ON** ID's as small as 1/4", OD's as small as 1/8", flats, tapers, narrow splines — in microinches (arithmetical or r.m.s. average). Measures ALL surfaces in many plants.

● **DEPENDABLY ACCURATE.** Meets or exceeds all ASA requirements. Simple to use, and tamperproof; no calibration by the operator. Built for continuous shop use.

● **COMPLETE as shown — $1295.00.**

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THE PROFILOMETER — First in roughness measurement, since 1936.

Profilometer is a registered trade-mark.

MMC MICROMETRICAL MANUFACTURING COMPANY

341 S. MAIN ST. ANN ARBOR, MICHIGAN

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VERSATILITY AND PRECISION TEAMED FOR PROFIT...

COVEL No. 32
UNIVERSAL AND TOOL GRINDER

As a man responsible for the profitable operation of your department or plant, you recognize the value of a machine which teams versatility with precision—does several different jobs, and does them well. Such a machine is the Covel No. 32!

On your internal, external and circular form grinding—on your tool sharpening operations—No. 32 reduces costs, increases your profit margin.

For convincing facts on this new 12 x 30 universal and tool grinder, with infinitely variable table and headstock speed control, mail the handy coupon right now!

COVEL PRECISION GRINDERS
BENTON HARBOR, MICHIGAN
Dept. G-16

HYDRAULIC & HAND FEED
SURFACE GRINDERS • UNIVERSAL
CUTTER & TOOL GRINDERS • DRILL GRINDERS

☐ Send full details on the No. 32.
☐ Have your representative call.

Name_____ Title_____

Company_____

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City_____ State_____

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NOW... get Hartford's famous

TRIPLE ACTION in fully enclosed cutting barrels

There's a new look in Hartford's Tumbling Barrels... but underneath you get the famous Triple Action Barrel originated by Hartford and unsurpassed for doing a better job ...faster... at lower cost.

Compare these advantages! The Hartford fully enclosed Model 1956 is extremely compact . . . requires less floor space than most enclosed barrels. With Hartford the power unit is on top, where it belongs for long life, cleanliness and ease of maintenance. Barrel is mounted on rugged "A" frame for maximum strength. Streamlined steel enclosure confines splash and contributes to safe operation. Pivoted front guard opens to permit quick, easy loading and unloading . . . plus easy removal of barrel assembly. Standard power unit has four speed gear shift transmission. Literature and prices promptly furnished.

Hartford

PRECISION BALLS • RETAINERS BEARINGS • TUMBLING BARRELS

HARTFORD STEEL BALL CO., INC., 21 Jefferson, W. Hartford 6, Conn.

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IT TAKES LESS TIME TO MICRO-FINISH HARD MATERIALS WITH

ELGIN DIAMOND

Color Identified for Positive Use
Grades for Every Purpose
Use Any Standard Finishing, Polishing or Lapping Technique
Finish with diamond... Elgin Diamond!
Ready to Use, No Mixing

This booklet will help you Write for your free copy now!

See pictures of Elgin diamond in application . . . gives details of method, grades to use and time required. Write today!

ABRASIVES DIVISION

ELGIN NATIONAL WATCH COMPANY

Dept. A-1

ELGIN, ILL.

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Now! SAFER

Cut-off Machine Operation *with the* New BULLARD!

This outstanding machine is designed to give maximum safety . . . has many features:

- Cutting Wheel Completely Enclosed
- Fast Production
- Economical Operation
- Close Work Tolerances

Semi-automatic hydraulic operation is foot controlled, leaving both hands free.

Floor Space 24x42"

Write for circular and complete machine specifications TODAY!

BULLARD

Geo. H. Bullard

COMPANY INCORPORATED

HOPKINTON ROAD WESTBORO, MASSACHUSETTS

SPECIALTY MANUFACTURERS OF RESINOID BONDED HIGH SPEED GRINDING, CUT-OFF AND COPING WHEELS

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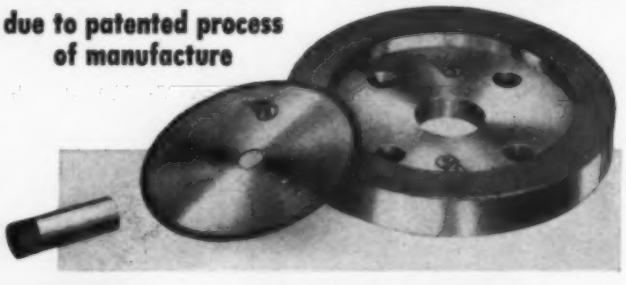
FASTER CUTTING • LONGER LASTING

due to patented process of manufacture



STEELSET Diamond Wheels

(for wet grinding)

Made by a superior patented process, **FS STEELSET** Diamond Wheels have exceptionally fast cutting properties. Grinding costs are halved. They have excellent non-glazing and non-burning characteristics, coupled with remarkably long life—as much as five times greater than resinoid or vitrified bonds.

Produced by a hot-press powder metallurgical method. The diamond particles are coated by high vacuum technique to insure extra strong gripping action by the sintered steel bond. This prevents their premature pulling out of the metal matrix.

In many types for a wide variety of applications.

Drills, blades, hones, lens laps, center laps, etc.

Attractively Priced • Fast Delivery

WRITE FOR CATALOG DT 353

FISH-SCHURMAN CORP., 81 Portman Road, New Rochelle, N.Y.

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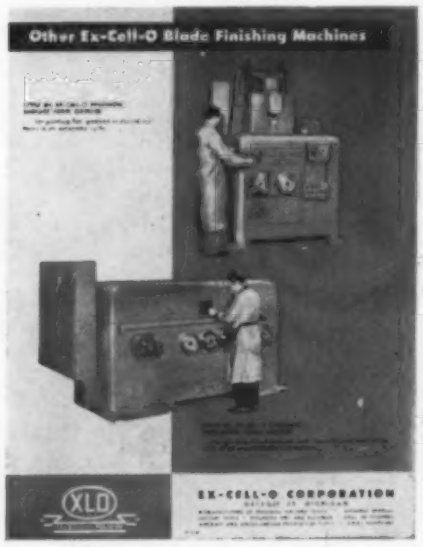
Available Literature

Catalogs and Bulletins Available from Manufacturers

For copies of the literature in which you have an interest use the postage-paid postcard. Merely circle the identifying number and mail the postcard.

1. **Profiling Machines.** Precision machining of jet engine compressor and turbine blades, is the subject of a new bulletin prepared by Ex-Cell-O Corp., Dept. GF, 1200 Oakman Blvd., Detroit 3, Mich. Profile milling, grinding and polishing are described as supplementary pictures show typical applications of these operations. Bulletin 50620A describes coordination of tool-to-work contacts and indexing movements, type of back rests used to support airfoil forms being machined, the milling cutters, grinding wheels and abrasive belts that are used and other related information.

(see Number 1.)



2. **Thread Grinders.** Catalog No. 600, published by Jones & Lamson Machine Co., Dept. GF, Springfield, Vt., describes and illustrates their automatic thread grinding machines. The rapid, simplified technique for accurate work, provided for by these machines, enables an operator to run two machines on many jobs, or perform other functions while tending only one. The wheel is automatically kept sharp and true

(see Number 2.)

CORTLAND SNAGGING WHEELS

Cortland is good business for you, too

From our front lawn you'll look up into the surrounding hills, tree-covered except where the rocky walls rise sheer and stark. Freight cars on our siding and trailer trucks at our shipping platforms, are loading for Springfield and the East — Albany and the West.

Business is good here in Chester, Massachusetts because so many manufacturers have found that Cortland Grinding Wheels are *best by test*. You see, there's a lot of "know-how" required to make a good wheel. It starts with specifications based on the job you want to do. It develops in the laboratory, mixing rooms, press rooms, ovens, kilns, finishing machines, and in marking, packing and shipping. Men and women have a lot to do with it — people who have made Cortland Grinding Wheels a living symbol of New England Craftsmanship.

Come up and see us sometime!

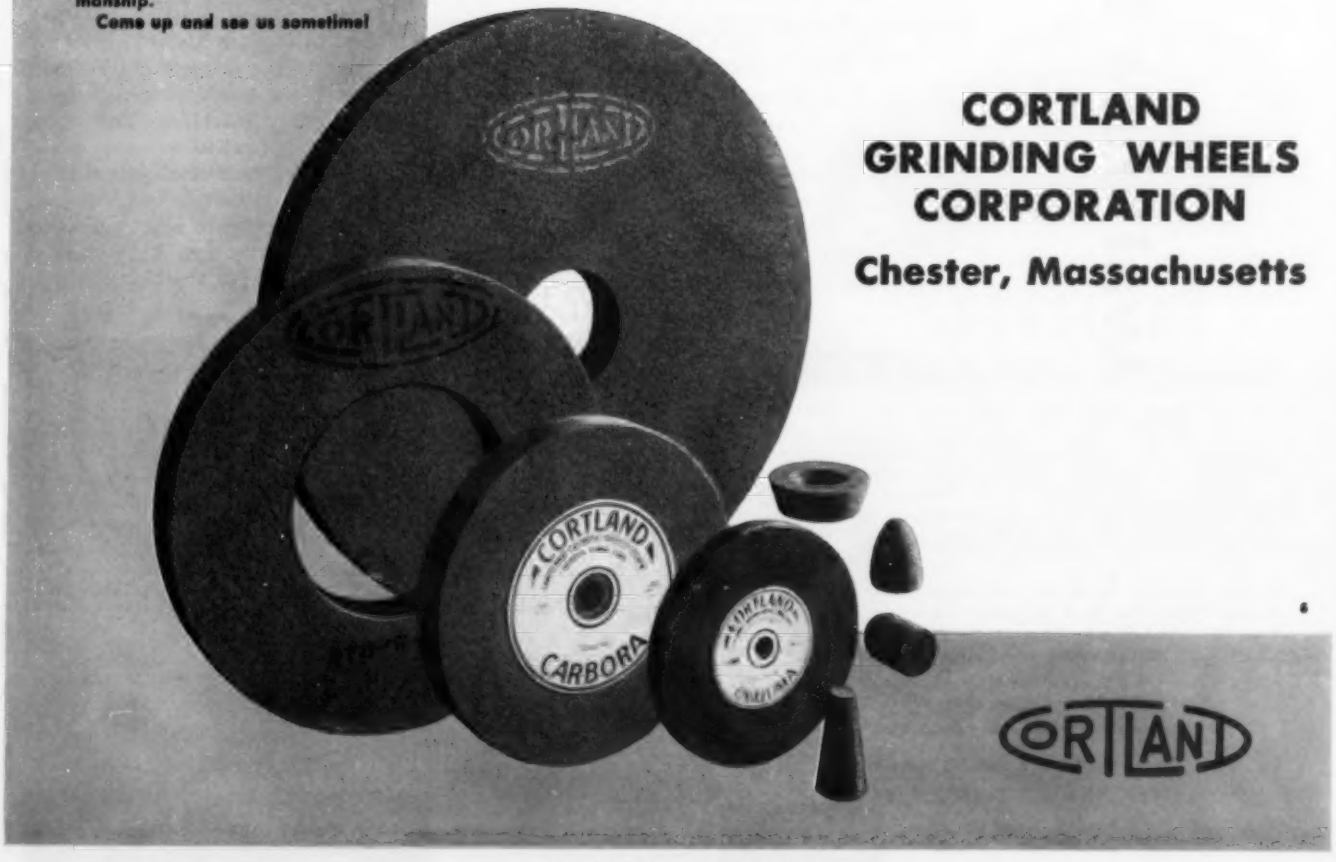
You, too, can prove them "Best by Test" on castings, forgings, billets and weldments

Snagging is one job where you want results *fast*.

Customers have found that it pays to install Cortland engineered Snagging Wheels, Cones, Cups.... The operators turn out better work because the cuts are fast, cool — and always *right* for the job. "Down-time" is reduced — the wheels last longer, because the abrasive, grain size, grade, structure and bond were all specified to give best possible performance.

You, too, can prove Cortland Snagging Wheels "Best by Test" on your swing frames, stand grinders and portables. Cortland's Oxaluma (aluminum oxide) and Carbora (silicon carbide), in Vitrified and Resinoid bonds, can be developed for you in all standard wheels and in special shapes to meet your snagging needs.

Let the Cortland Man help you —
he knows his business: *better grinding*.



CORTLAND GRINDING WHEELS CORPORATION

Chester, Massachusetts

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throughout its effective life. Therefore metal is removed by a true cutting action in the form of chips instead of dust, without burning the work or sacrificing accuracy.

3. Centerless Grinding. Type 914, heavy duty, reversible traverse centerless grinding and finishing machine is described and illustrated in a bulletin published by Production Machine Co., Dept. G, Greenfield, Mass. Using abrasive belts as grinding and regulating mediums, this proven method of metal cutting has met with outstanding success in the metal working field. This machine offers rapid change of setup; reversible traverse; automatic contour pressure control; no wheel dressing required; and hydraulic belt tension.

4. Portable Tools. Bulletin No. 53, published by The Rotor Tool Co., Dept. RG, 26300 Lakeland Blvd., Cleveland 32, O., describes and illustrates their complete line of portable air tools. Specifications are also given for assembly tools, (screwdrivers, nutsetters and impact wrenches); drills, (from ¼" to 2" capacity); small wheel grinders, (up to 3" straight wheels); straight grinders; vertical grinders; scalers, chippers and rammers.

5. Tumbling. A catalog describing and illustrating the complete line of tumbling machines, screen separators, nylasugs, etc., is available from Rampe Mfg. Co., Dept. F, 14915 Woodworth Ave., Cleveland 10, O. This catalog also includes specifications on all equipment from the Mini-Tumbler up to the largest machine which is an eight cubic foot model. Prices are also included and shipments can be made from stock immediately.

6. Thread Grinders. Catalog No. TFG 13579, published by The Sheffield Corp., Dept. FG, Dayton 1, O., describes and illustrates their precision thread and form grinders for quick and accurate grinding of threads and forms; Crushtrue plunge or traverse grinding; Diamond-dressed multi-ribbed grinding; and conventional single point wheel grinding. Five different models are offered and specifications are given for each. Principal elements, a table of workhead spindle speeds, and accessories available are also included.

7. Grinder Control. A new precision automatic grinder control, Type 150, known as MICROtrol, is described and illustrated in a new bulletin available from Airborne Instruments Laboratory, Inc. Dept. GG, Mineola, Long Island, N.Y. The in-process part dimension is continuously monitored by the precision probe. The electronic control unit converts the probe output to readings of three indicators, one each for rough size, finish grind size, and size after sparkout. Arrival at each size limit actuates a heavy-duty relay to control wheel feed and sparkout dwell time.

8. Tool Grinders. Bulletin No. A-8, published by J. G. Blount Co., Dept. G, Everett 49, Mass., describes and illustrates their line of combination tool grinders. Included are the model J wet grinder, model G wet and dry grinder, model B wet grinder, model GB wet grinder, and model TC wet grinder. Wheel combinations are given along with complete specifications.

9. Drill Grinders. Black Diamond Saw & Machine Works, Inc., Dept. FF, Natick, Mass., has released a bulletin describing and illustrating their line of floor and bench models of Worcester drill grinders. These grinders are said to accurately sharpen 2, 3 and 4 lip drills, flat twisted drills and flat or chucking drills. Construction features,

(see Number 5.)

specifications, and a complete operational description are included.

10. Internal Grinding. Bryant Chucking Grinder Co., Dept. GR, Springfield, Vt., has announced publication of three new folders on special equipment for internal grinding. Bryant's new series 800 high frequency wheelheads is illustrated and described in an 8-page folder. A second folder describes automatic sizing for Bryant internal grinders. This folder illustrates air sizing, solid plug sizing and diamond sizing with schematics. The third describes Bryant's new Process Controller which provides statistical quality control.

11. Abrasive Belt Splicers. A new folder released by Econaway Mfg. Co., Dept. FG, Bellevue, Mich., describes and illustrates the floor and bench model abrasive belt splicer. This machine is said to perform every step necessary for a perfectly spliced belt or sleeve, which will run straight and true. This eliminates the need of investing in a large

(see Number 3.)

(see Number 4.)

(see Number 6.)

quantity of abrasive belts of different lengths and grades. Short pieces of abrasive left from rolls can be made up into belts.

12. Grinding Wheels. FM SiClone wheels for grinding carbide tools are described in a new bulletin published by The Fuller Merriam Co., Dept. RG, 70 Water St., West Haven, Conn. These wheels are claimed to incorporate proper size of particles of silicon carbide abrasive, the proper number of such particles to be brought into contact with the work, the most efficient distribution pattern of particles, and a vitrified bond to provide the perfect setting for the ideal distribution of abrasive particles necessary for rapid removal.

13. Double Disc Grinder. A new 8-page catalog, illustrating and describing the new Gardner 2V18 precision double disc grinder, is available from the Gardner Machine Co., Dept. F, Beloit, Wis. Catalog No. 2V-55 will be of special interest to production men interested in a precision grinder designed to generate parallel and flat surfaces on a variety of small parts. This machine is designed to economically grind two flat surfaces of small workpieces simultaneously.

14. Cylindrical Grinding. Precision cylindrical grinding machines, exhibited by the Landis Tool Co., Dept. GF, Waynesboro, Pa., at the recent Machine Tool Show, are described and illustrated in a new 20-page booklet. Included are integrated production lines, automatic grinders and standard machines. These machines are said to incorporate new features for precision, ease of setup, faster feeds, heavier stock removal, work handling and gauging.

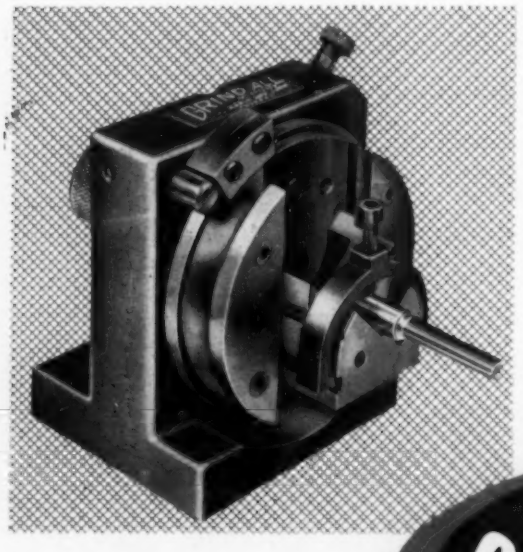
15. Portable Air Tools. Master Pneumatic Tool Co., Inc., Dept. RG, Bedford, O., has published a bulletin, No. 1030A, describing and illustrating Master Power portable air tools for grinding, sanding, buffing and wire brushing. Vertical, horizontal, die and midget grinders, vertical sanders, horizontal buffers, and vertical and horizontal wire brushes are described along with a complete line of portable tool accessories, and die grinder attachments.

16. Mechanical Finishing. Mecha-Finish Corp., Dept. G, P.O. Box 308, Sturgis, Mich., has published a catalog describing and illustrating the Mechamatic machine for mechanical finishing. The Mechamatic method employs the principle of controlled, high speed, directional flow of small abrasive in the form of a wet slurry. This abrasive mass is contained within the retaining walls of a circular annular compartment rotating at a relatively high speed and consequently presents no return or recovery problem.

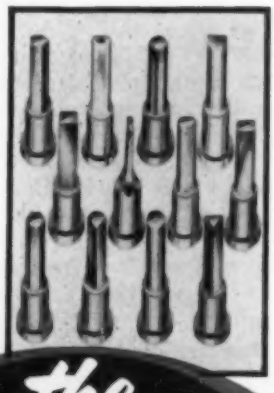
17. Stock Removal Film. Literature is available from Micromatic Hone Corp., Dept. GG, 8100 Schoolcraft Ave., Detroit 38, Mich., briefly outlining the contents of a new film "Progress in Precision." Film is 16mm sound and approximately 30 minutes long. It will be of special interest to industrial and technical organizations concerned with stock removal processes, precision and functional surface finishes.

18. Instrument Development. Micrometrical Development Corp., Dept. FF, 2821 S. State St., Ann Arbor, Mich., has announced that its services are now available for the development of instruments for measuring displacements and surface characteristics and for similar assignments. These services include the design, development, building and testing of complete electro-mechanical instrumentation. The company's capabilities are explained in an illustrated bulletin by means of case histories.

19. Wheel Truing. For regular, everyday truing and wheel conditioning a new device is being distributed by M. E. Neuber Industrial Diamond Co., Dept. GR, 791 Tremont St., Boston 18, Mass. The device uses one diamond nib for face or side conditioning of the wheel. Designed and manufactured by Palmer Mfg. Co., it is known as the "Little Speedy." It is said to obviate

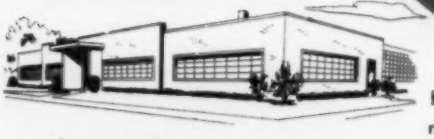


Perforator Grinding
±.0002 with greatest speed accuracy and range



the Grind-All FIXTURE

made by the house that precision built



Here is higher accuracy, greater range and maximum speed in grinding perforators. Meets the requirement for a more versatile perforator grinding attachment. Grinds many irregular shapes concentric with shank.

Also performs other functions such as light milling and boring fixture, inspection tool, etc.

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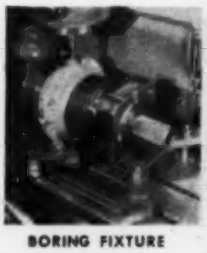
Consult our engineering staff when you need special machine tools or dies. Send for free catalog.

Harig Manufacturing Corp.
[illegible] W. HOWARD ST., CHICAGO 31, ILL.



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INSPECTION TOOL

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aluminum oxide flours precision graded

to micron sizes in grade Nos.

280
320
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For lapping, honing and polishing operations where precision and uniformity are a must.

"MICRO-GRADED" ABRASIVES manufactured by:

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Write for prices and samples

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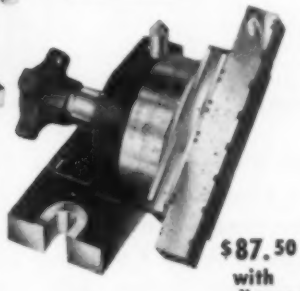
now
TWO NEW VERSATILE TOOLS

FOR ECONOMICAL DRESSING — The G-5 radius dresser is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on a 7 inch or 10 inch wheel. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal gives chatter free operation that may be set to the exact radii desired.

$80.00 with diamond

A LOW COST DOUBLE DUTY TOOL— The G-2 angle dresser and tool holder is actually 2 tools in one, having an easy to read vernier scale 0° to 180° giving accuracy within 2" of 1°; an excellent time saver to set up small jobs to be milled, drilled, tapped, etc. on any desired angle.



$87.50 with diamond

PLUS FREE HANDY STORAGE BOX.

$149.50 COMBINATION PRICE FOR BOTH TOOLS WITH DIAMONDS.

Send your order direct but include the name of your distributor.

DISTRIBUTORS WANTED. Write for complete information.

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Box 202 Elmwood Station • Providence 7, R. I.

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DUST COLLECTORS

SAVES INSTALLATION TIME

Stop dust quickly, at lower cost, with Dustkop. Thirty-seven standard models *ready to use* and available from stock. Dustkop conserves floor space, reduces maintenance. Collects almost all types of industrial dusts. Write for descriptive literature.

Also a complete line of Mist Collectors

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MORRISON

MAKES 90% OF ALL Wheel Guards

Used On Portable Grinders

REVOLVING CUP GUARD

MORRISON Guards are designed for greatest safety, lightest weight, maximum strength and lowest cost.

All Morrison Guards have been developed in collaboration with the Safety Committee of the Grinding Institute.

A MORRISON GUARD For Every Portable Grinder Built— ***Write today for Literature.***

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16816 Waterloo Road — Cleveland 10, Ohio

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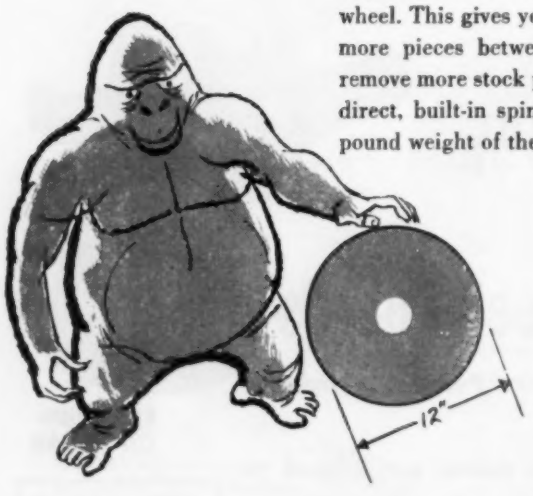
Jumbo Jobs?

Sure . . . on an ABRASIVE No. 1½

Because the Abrasive 1½ table has a 10" x 15" chuck with a full 150 square inches of surface area. A big handfeed grinder designed to do more, more easily, the 1½ gives you a full 12" capacity under the wheel. A lot of grinder for the money.

A GORILLA FOR WEAR

A gorilla for wear, the No. 1½ takes a 12" wheel. This gives you more cutting surface, more pieces between dressings. You can remove more stock per pass, too, because of direct, built-in spindle power and the 200 pound weight of the wheel slide and motor.



FAST AS A RABBIT

Fast as a rabbit, the No. 1½ precision tool room grinder with Electrabrasive control saves you time, gives more precision, maintains finish and eases operation. A big, new feature, the Electrabrasive stepless, variable-speed spindle electronically maintains a constant 5500 peripheral surface speed from a 12" to a 6" wheel, while maintaining effective torque. To operate all you do is set the knob on the wheel head!

A two-cent post card will bring you this whole story on the BIGGEST little grinder on the market.

ABRASIVE
Machine Tool Company
East Providence 14, R. I.

For Forty Years
First For Accuracy — Economy

ABRASIVE

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setup changes and can be positioned perfectly on any magnetic chuck.

20. Hole Grinder. A new brochure available from Pratt & Whitney Div., of Niles-Bement-Pond Co., Dept. F, West Hartford 1, Conn., describes and illustrates their No. 2E vertical precision hole grinder. This machine is said to grind holes round, straight and to size within .0001"; with table settings accurate to .0001". Grinding speeds are from 4,000 to 100,000 rpm. The machine will grind straight or taper holes and radii, and by adding a P&W rotary table, any simple or compound angle can be located and ground without special fixtures.

21. Diamond Tools. A new 6-page bulletin available from Permattach Diamond Tool Co., Inc., Dept. RG, Milford, N.H., shows how the firm's method of mounting diamonds permits use of stones 2/3 smaller than previously used. Result of "fusing" diamond to tool shank is described. Under the Permattach process, the diamond is chemically "wetted" and welded to the tool shank. It does not rely on any mechanical grasp upon the bulk of the diamond. Diamonds can be surface mounted under this process.

22. Lapping Machine. Automatic, superfine finishing, on the Gyro-Matic "21" lapping machine is described and illustrated in a new bulletin available from Spitfire Tool Co., Dept. GR, 2931 N. Pulaski Rd., Chicago 41, Ill. A complete illustrated description of the machine is given along with specifications, special features and operating directions.

23. Cutting Oil. A versatile transparent cutting, Sunicut 5534, is described in a new bulletin, No. 39, available from Sun Oil Co., Dept. FG, Philadelphia 3, Pa. Designed for use on a wide variety of steels, this non-emulsifying oil can help reduce downtime in jobbing shops and in screw-machine shops where frequent changes of stock and operation are normal. Oil contains sulfur, chlorine, and a fatty oil and is formulated to cover a large range of machining operations.

24. Dust Collectors. Catalog No. 39, published by Torit Mfg. Co., Dept. F, 287 Walnut St., St. Paul 2, Minn., describes and illustrates their complete line of dust collectors, optional equipment, accessories and blowers. Included are cabinet cloth filter types, cyclone separator types and the optional equipment available for all models. Dimensions and specifications are given. These dust collectors trap dust at its point of origin to keep bedways, saddles, slides and bearing surfaces clean.

25. Steel Shot Abrasive. A bulletin describing Steel Shot, a cast steel, heat treated, blast cleaning and peening abrasive, has been published by Wheelabrator Corp., 1169 S. Byrkit St., Mishawaka, Ind. Booklet includes a tabular comparison of the characteristics of the various types of metallic abrasives, and a discussion of the factors important to the economical and efficient consumption of abrasive. Performance data on the Wheelabrator shot is presented from various industries.

26. Flexible Shaft Machines. Two new bulletins are available from Wyzenbeek & Staff, Inc., Dept. GF, 223 N. California, Chicago, Ill., describing and illustrating their complete line of Wyco flexible shaft machines; angle heads; handpieces; multiple speed machines; No. 301 Hy-Speed portable saw for metal, wood and plastic; universal high speed grinder; flexible shafts with non-metallic innerliner; accessories, arbors and adaptors; hole cutters; disc sanders; angle drills; polishers; tire buffers; and adjustable hole cutters. Specifications and prices are given.

27. Overhead Drive. The advantages of an overhead drive on a universal grinder is described and illustrated in literature available from Crystal Lake Grinders, Dept. GR, Crystal Lake, Ill. One example is a 2 hp motor mounted overhead on a No. 1018 universal grinder, driving the wheel head spindle ninety degrees from grinding pressure which keeps the bearings round and doubles their life. Besides other advantages the table can be moved easily as several hundred pounds are taken off the table.

LOOK AT THIS UP-TO-THE-MINUTE EXHIBIT OF

POPE PRECISION SPINDLES

EXHIBIT A

POPE SUPER-PRECISION, HEAVY DUTY BORING SPINDLES for boring holes round within millionths of an inch. Available in both belt driven and motorized units to meet a wide range of speeds and horsepower. Send us your specifications for quotations.

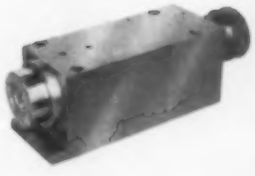


EXHIBIT B

POPE 1 HP, TOTALLY ENCLOSED 3600 RPM MOTORIZED, CARTRIDGE TYPE PRECISION SPINDLES with double row cylindrical roller bearings and separate thrust bearings for no endwise movement of the shaft

EXHIBIT D

POPE HEAVY DUTY, ¾ TO 100 HP DIRECT MOTORIZED SPINDLES for Horizontal or Vertical Skin Milling, Grinding, Milling, Boring and Other Operations

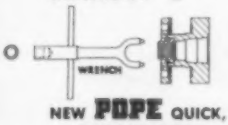
EXHIBIT F

POPE HEAVY DUTY VEE-BELT DRIVEN, PRECISION MILLING SPINDLES, and Wheel Heads, ½ to 50 HP

EXHIBIT G

POPE INTERNAL GRINDING SPINDLES for Bryant, Excello, Heald and Landis Grinders.

EXHIBIT C



NEW POPE QUICK, SELF-REMOVING WHEEL HOLDER for surface grinders and tool and cutter grinders — eliminates the necessity of a wheel puller. Write for quotations.

EXHIBIT E

POPE SUPER-PRECISION MOTORIZED TOOL AND CUTTER GRINDER SPINDLES with clearance Angle Swiveling Heads for *Angular Adjustment In A Vertical Plane*

EXHIBIT H

POPE SUPER-PRECISION HIGH FREQUENCY HEAVY DUTY GRINDING AND MILLING SPINDLES for speeds up to 100,000 RPM

WRITE FOR COMPLETE SPECIFICATIONS, PRICE AND DELIVERY

No. 107

Specify POPE PRECISION SPINDLES

POPE MACHINERY CORPORATION

Established 1920

261 RIVER STREET · HAVERHILL, MASSACHUSETTS

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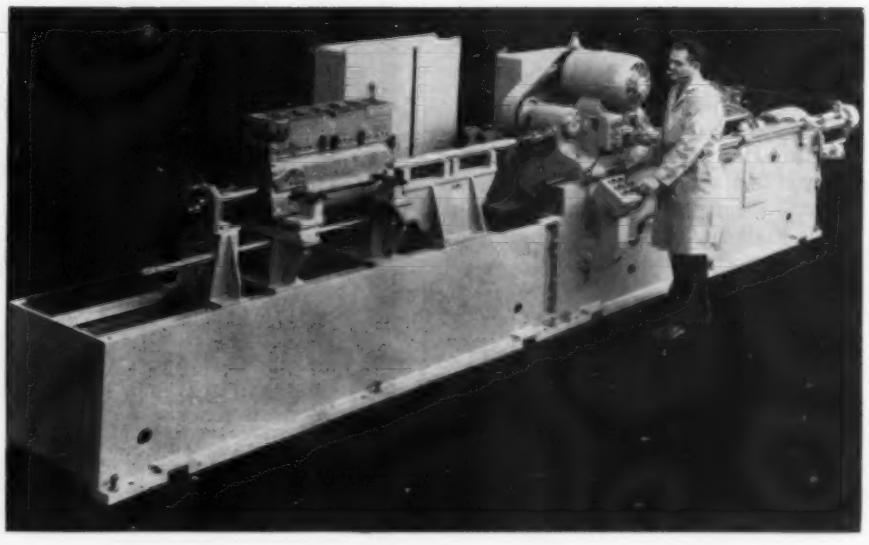
Main Bearing Alignment Generated by Microhoning



In a new application, a major diesel engine manufacturer is using the microhoning process to generate accuracy and alignment in the main bearings of his engine block.

The microhoning tool has nine banks of plastic guides and one bank of abrasives which are automatically expanded by one cone. As the tool is reciprocated through the bearings, it is piloted and stabilized by the guides. All bores are microhoned in perfect alignment and are made round without taper or overcutting at the ends. As the desired diameter is obtained, the microsize (automatic sizing) control initiates the ending of the cycle and the withdrawal of the tool.

This microhoning technique was developed by Micromatic Hone Corporation, Detroit, Mich., the designer and builder of both the tool and the model 606 Horizontal Hydrohoner machine on which the application is performed. Optionally-equipped with automatic feeding and sizing controls, this machine has a six-foot maximum stroke and is adaptable to a wide range of both OD and ID honing applications.

Stock is removed at an economical rate while obtaining any desired surface finish consistently on every part. •

Use HANDY Postpaid Card. Encircle No. 101

Combined Magnetic Separator and Filter Has 85-90% More Magnetic Attraction

A new combined magnetic separator and filter for separation of ferrous sludge and abrasives from coolants developed by Delpark has 85-90% more magnetic attraction, the greatest magnetic force ever developed for this purpose.

This unit uses a new method of gravity flow and magnetic attraction. It is the only separator using gravity flow of liquids on top of the magnets giving the benefit of both gravity and magnetic separation. Through the efficiency of the magnets in handling the great swarf load, the filter size has been reduced while flow capacity has been increased. 25-50% less floor space is required, and operating costs are greatly reduced. One of the outstanding advantages is the greater swarf load capacity. In field use these units have easily handled the grinding load created by a one two-hundred-thousandths single cut from cast iron.

These combined magnetic separating and filter units are continuous, full flow capacity, self cleaning and fully automatic. A tote box with a dividing plate separates the swarf from the used paper. Disposal is quick and convenient. Near absolute filtration is achieved with greater efficiency and economy of operation.

For further information, write to Industrial Filtration Co., Dept. CM-478, Lebanon, Ind. •

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Diamond Impregnated Hand Hone

The newest development of A.I.T. Diamond Tool Co., is the diamond impregnated hand hone, which incorporates color-matic selection of different size diamond particles.

The color has been used in the handle which is transparent plastic, non-rust, and non-corrosive. A clear handle distinguishes roughing hones, red identifies medium finishing and blue distinguishes fine finishing.

In addition, two separate bonds are used in one hone. On one end of the No. 0042 hone, Al-Aloid bond is used for a roughing job, and on the other end Resin bond is used for finishing. This combination is said to cut costs and increase the possible use of hand hones. •

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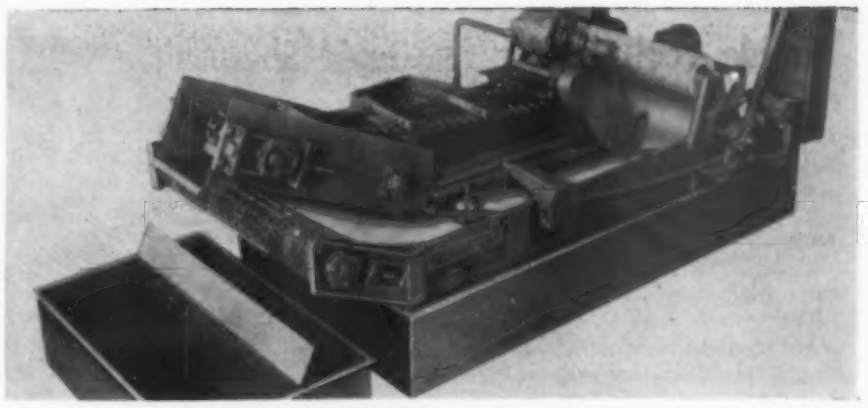
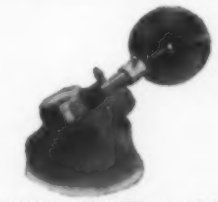




PERFECT FOR INTERNAL HOLES AND IRREGULAR DIES

REACHES "INACCESSIBLE" PLACES — THE FINEST DETAILS

TO FINISH IRREGULAR AND CURVED SURFACES— ALSO SHOULDERS AND RECESSES

Di-Profiler

RECIPROCATING HAND MACHINE

A rapid, accurate, easy-to-operate tool that saves costly hours on dies, molds and precision parts. Indispensable for filing, scraping, lapping and polishing operations involving flat or curved surfaces. Intricate details are finished in a fraction of normal time.

The Di-Profiler has a stroke adaptable from 0 to 6 mm. (¼"); reciprocation can be varied from 0 to 100 strokes per second.

Accessories include steel and diamond files, diamond discs, laps, T-C scrapers, and other tools.

For complete details, write Dept. D16

ENGIS EQUIPMENT COMPANY

431 S. DEARBORN ST. • CHICAGO 5, ILL.

Special products for finishing

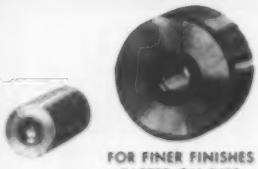
HYPREZ

DIAMOND COMPOUNDS

For all finishing jobs, from roughing to mirror polish. Hyprez, the original Diamond Compounds, have world-wide acceptance for their superior quality and results.

The exclusive Hyprez vehicle, exactly graded diamond particles, rigid control of quality, all guarantee that Hyprez will do your finishing job best. Available in 18- and 3-gram sealed cartridges for use with the Hyprez Applicator Gun.

For complete details, write Dept. H16



FOR FINER FINISHES FASTER ON DIES

ASSURES LONGER TOOL LIFE, GREATER PRODUCTION

COST SAVINGS FOR MOLDS AND HOBS

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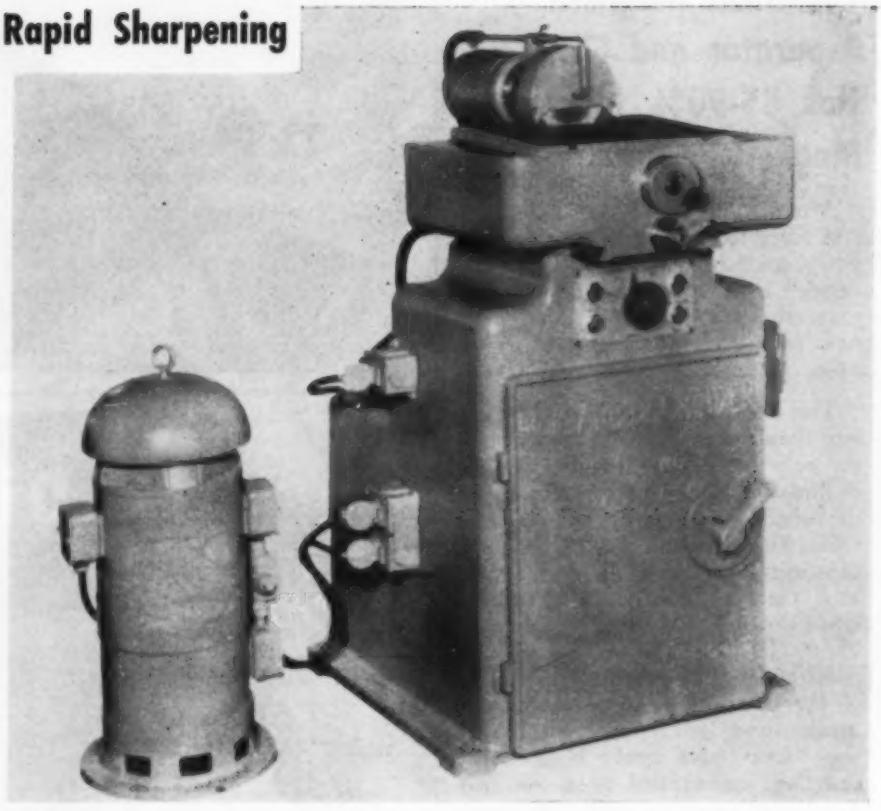
Carbide Tool Grinder for Rapid Sharpening



This new carbide tool grinder, called the Hi-V, is manufactured by Ohio Metal Working Products Co., 1836 Euclid Ave., Cleveland 15, O.

It was made specifically for rapid sharpening of single-point carbide tools, and carbide inserts, employing a 10,800 rpm spindle speed.

The grinder uses a nickel-bonded, single layer diamond wheel to achieve a cu. in. rate of carbide removal greater than conventional grinding.

The Hi-V grinder is claimed to remove carbide at these high rates without introducing stress into the carbide matrix. This results in reduction of fracture and chipping at the cutting edge.

The grinder is said to operate safely at 10,800 rpm due to the rugged precision of the Parker-Majestic dynamically balanced, motorized direct drive hi-cycle spindle, and because the single layer nickel-bonded diamond wheels are dynamically balanced for high speed service.

Two wheels speeds with selective clockwise and counter clockwise rotation are provided for convenience and accuracy. The 10,800 rpm speed is provided for high volume stock removal, and a 3600 rpm speed is also provided for accurate off-hand grinding of small radii. Simple controls are provided for wheel direction and speeds.

An electro-dynamic brake interlocked with protective relays, brings motor to full stop before reversing for absolute safety of operator and machine. Also included is an electric control panel completely built-in JIC standards. •

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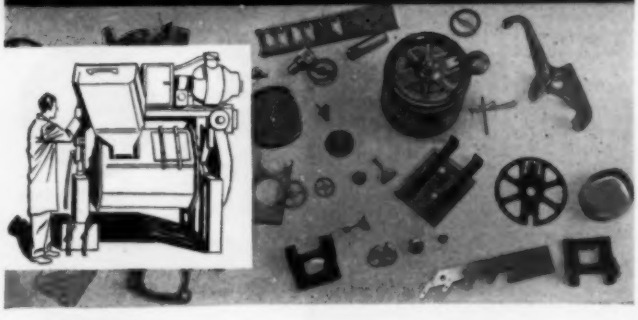
For Precision Barrel Finishing



Direct labor savings as much as 97% have been experienced in deburring small parts by precision barrel finishing . . . an improved method of tumbling.

Barrel finishing using **NOVACULITE** chips produces an exceptionally clean, dimensionally uniform and smooth finish without clogging or charging the work. Let us show you how **NOVACULITE** can work for you.

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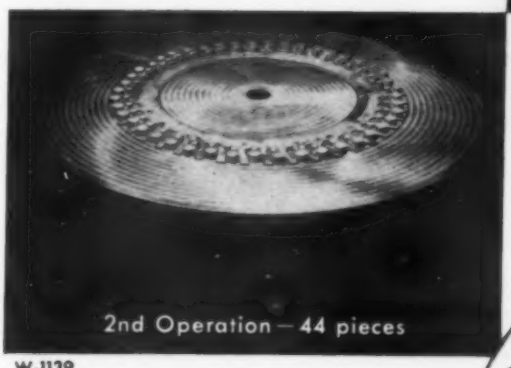


W-1139

# of Blanchard versatility

No. 303 Stainless Steel Forging

653 oddly shaped, non-magnetic workpieces

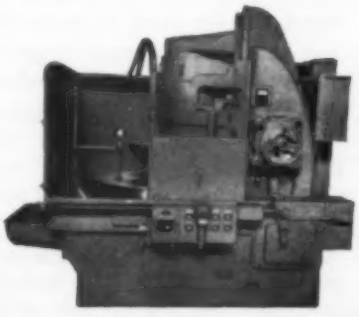
Blanchard Surface Grinders are noted for their unusual versatility – like grinding small, non-magnetic stainless steel forgings in quantity.

In the first operation, 653 forgings are loaded and blocked between rings on a No. 18 Blanchard, with 36" magnetic chuck (stock removal .010"). Parts, chuck and rings are sprayed with oil, and molten sulphur is poured around the parts to hold them. After grinding, the sulphur is easily stripped away.

This entire operation takes only 1½ hours – including preparation of the sulphur.

In the second operation, 44 pieces are set in a notched steel ring. Tilting the wheelhead and maintaining wheel pressure in one direction holds these non-magnetic pieces in the notches. Stock removal from this surface is .030", to tolerance of ±.003. Each load takes eight minutes – floor-to-floor.

As a result of this ingenious workholding, each piece is ground on both sides in a fraction of a minute, at less than 98¢ abrasive cost for all 653! That's typical of the convenience and economy of grinding on a Blanchard – whether the parts are magnetic or non-magnetic!



Send for free copies of "Work Done on the Blanchard", 4th edition, and "The Art of Blanchard Surface Grinding", 3rd edition – recently revised.

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

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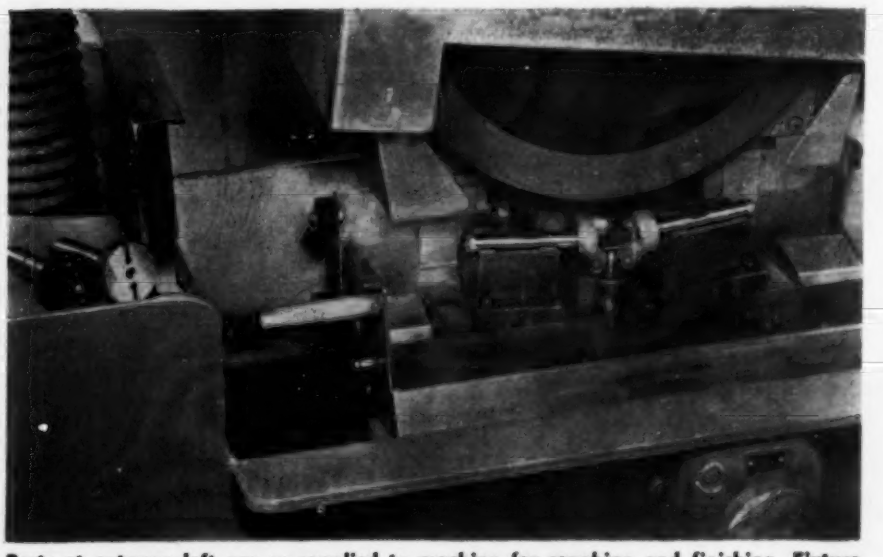

Parts at extreme left are as supplied to machine for roughing and finishing. Fixture turret has double acting locators which retract from hole or slot then move down when cycle button is depressed before wheel can descend. Carbide insert surfaces are provided for locators and vee blocks.

Machine for Rough and Finish Slot Grinding

Planet Products Corp., Cincinnati 27, O., has announced a new machine for rough and finish grinding of various slots in soft or hard parts. The machine illustrated rough grinds nominally .125″ slots in vane type refrigerator compressor rotors and then finish grinds these same slots to .138-.140 after heat treating to 55-58 Rockwell C. Material in the rotors is 8655 steel. Finish slots are ground to a production surface finish of 5 microinches or less and total variations in flatness and parallelism between the opposing faces of the slots are held to less than .0003 inches. Finish accuracy requirements are important because of the difficulty of efficiently compressing refrigerant gas and the need for extremely long, trouble free, service life.

Some of the features of the machine to achieve this performance are as follows:

1. Automatic diameter compensation as wheel is dressed. Spindle axis is automatically lowered so that periphery of wheel is maintained at proper depth in slots. Wheel diameter feeds directly in inches and thousandths as indicated on a counter which is easily read near the hand crank for traversing the diamond across the wheel. Three in-and-out positions of this crank determine whether only the diamond moves, only the wheel moves, or whether the two move in a correlated manner.
2. A two-speed motor is employed so that a high surface speed can be used for roughing and medium speed for finishing. Nominal cut speeds are respectively 12,000 and 6,000 feet per minute.
3. Cycle control is arranged so that when set for roughing the wheel not only runs at high cut speed but also oscillates in a vertical direction to alternately plunge and relieve the grinding wheel. When set for finishing the cut speed is reduced and the wheel feeds steadily.
4. An air-oil feed system regulates the rate of down feed of the wheel.
5. The wheel head is pivot mounted for simplicity and long life. The trunnion axis is equipped with position adjustment and direct reading indicator.
6. Air-oil and mechanical control components are housed in a lockable inset panel on the left side of the machine; a similar enclosure houses electrical panel on the right side of the machine.

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• New method of gravity flow and magnetic attraction.
• Smaller filter . . . greater flow capacity.
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• 25-50% less floor space required.
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Combined Magnetic Separator and Filter
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Write for more detailed information.
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7,700-s.f.p.m. wheel speed is "stopped" by 1/10,000 sec. stroboscopic exposure. (Wheel guard opened and coolant flow reduced to reveal cutting action.)

The *right* Abrasive Cut-Off Wheel by CARBORUNDUM will slice through metal in seconds...12 to 20 times faster than a power hacksaw. You get clean, accurate cuts, without extra deburring and smoothing needed after shearing or flame-cutting. For wet cutting, to extremely close tolerances, use Rubber Bond Wheels...for dry cutting at high speeds, use Resinoid Bond. Tough CARBOFLEX Reinforced Wheels are tops for all portable cutting and slotting—combine fast action with maximum safety. Your CARBORUNDUM Distributor or salesman knows how to help you use abrasive cutting, profitably, in your shop. Call him today. For free Booklet #6, "Metallic Cutting Off," write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

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Sump Cleaning Machine Has 200 Gallon Capacity

A new machine tool sump cleaning machine which can be towed by existing plant tow trucks and tractors is manufactured by Coolant Equipment Corp., Verona, Wis.

The model 20T-NAW will remove from the machine tool sump all fine chips, sludge, and waste coolant by vacuum. If desired the coolant can be filtered and returned to the machine tool simply by changing the settings. Up to 200 gallons of waste coolant can be pumped into the storage tank for removal to the disposal area. The machine is equipped with fully automatic fill controls including vacuum and pressure gauges and release valves as well as a built-in system for discharging coolant from the tank. Cleaning machine tool sumps with the 20T-NAW can be accomplished in a matter of minutes without any of the usual messy spillage of oil around the machine tool.

A heavy duty wheel arrangement allows the machine to be towed safely over company streets and contributes to the ease with which one man can maneuver the cleaner around the machine tool. For towing the draw bar and loop is standard, however, the automatic self coupler, hook hitch and towing eye, and hitches to the customers specifications are available. •

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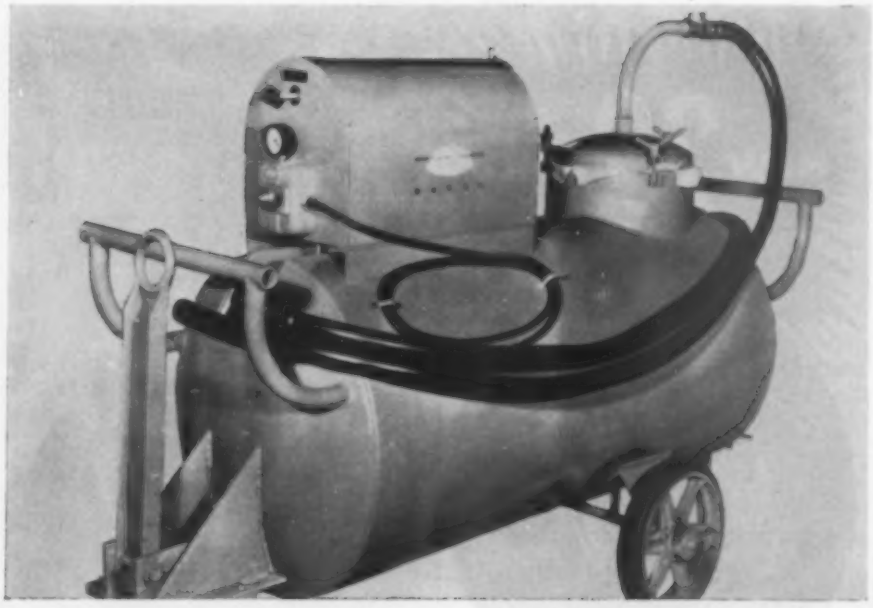

Fully Automatic Dimensional Separator

A new approach to the problem of difficult separations has been announced by Tumbling Sales and Service Co., 18 Beech St., Byram, Conn.

The Esbec dimensional separator will make separations which cannot be made either magnetically or by screening. It is not intended as a substitute for either of these methods but takes up where they leave off and will make separations which otherwise can only be done by laborious hand picking.

Some examples of separations are: needles and needle-like parts from steel balls; non-ferrous parts from chips of the same general size; ferrous parts from ferrous media; flat parts or chips from round ones; thin flat shapes from thick pieces of the same length and width; dissimilar parts which have been processed in the same load for economical or production reasons; dissimilar parts which have been mixed by accident; flat chips which cannot be screened from the chip load but which

The Walker Vacuum Chuck is proving an important essential in the development of the far-reaching jet engine program. *Non-magnetic materials* are held effectively for grinding at a marked saving of time and effort. *Uniform quality and increased production are assured by actual performance.*

O. S. WALKER CO. Inc.

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Original Designers and Builders of Magnetic Chucks

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NEW 22 BOND

BY "American"

OUTLASTS— OUTPERFORMS OTHER TOOLROOM WHEELS

Combines the cool cutting of open structure wheels with ability to hold size, even with deep, heavy cuts. Particularly adapted for toolroom operations using straight, dish, cup, or cylinder type wheels or segments. Also ideally suited for cylindrical or centerless grinding jobs.

BETTER BY TEST

Report from toolroom tests by a leading bearing manufacturer: An "AMERICAN" wheel (7 x ½ x 1¼) 77A60 HV-22 Aluminox took from .001 to .003 more down feed than the wheel regularly used on surfacing high speed as well as high carbon high chrome steel.

For a destruction test this wheel took a .050 cut on a piece of high speed steel 4 x 3 x 1½ with .010 to .015 hand cross feed and ground across the piece without burning.

Try this surprising new 22 Bond Wheel in your shop. Seeing is believing. Ask for descriptive folder . . . just mail the coupon today!

American Emery Wheel Works
Red Bridge, Providence 1, R. I.

Send folder describing your new 22 Bond Vitrified Wheel.

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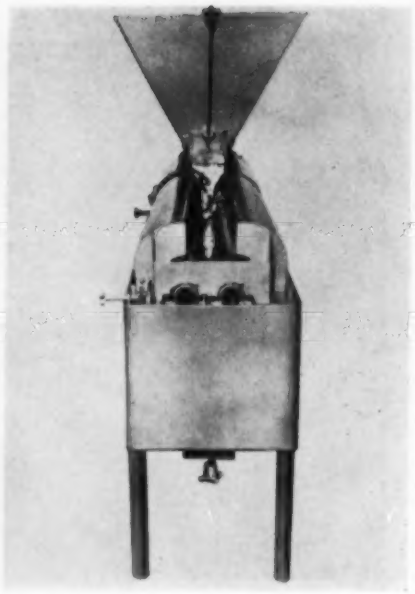

are subject to wedging in parts; mixed loads of steel media to eliminate sizes which might wedge, but which cannot be screened; grading of burnishing balls to eliminate sizes which might wedge in holes; and grading of tumbling chips to eliminate sizes and shapes which might cause wedging. It is also claimed to permit the tumbling department to use the sizes and types of media best suited to the individual job but which could not be separated from the work either by screening or magnetically.

Separations are made by reason of difference of critical dimensions of parts or chips. Four different micrometer type controls quickly adjust the separator for changes in size of material, hopper discharge, rate of feed, and rate of discharge. These, combined with a three speed drive, give the separator great flexibility and adapt it to a wide variety of jobs. •

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90° to 140° Included Angles Ground on New Drill Grinder

A simple, accurate adjustment for grinding drills to any included angle from 90° to 140° features the new model DV Sterling drill grinder recently announced by McDonough Manufacturing Co., Eau Claire, Wis.

Changing the included angle is accomplished accurately by tilting the grinding wheel head instead of adjusting the workholding unit. The angle adjustment is made by a hand wheel controlling a rack and pinion. A positive lock in the hand wheel holds the head at any angle.

Another feature is a built-in clearance gauge which accurately indicates the clearance angle being ground on any size drill. It is also claimed that the

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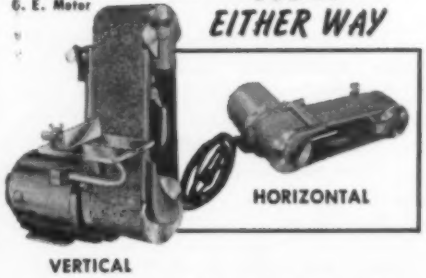
Full 1/3 h.p. G. E. Motor

USE IT EITHER WAY



At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use **$89.95**

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A few desirable distributor territories still available.

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drills are ground so completely that it is not necessary to grind the heels off by hand.

Model DV has the same capacity as models DA and DB—2, 3 and 4 flute drills from ⅛" to 2-½" diameter. Because no chucks or collets are used on any Sterling drill grinder, set-up changes for different drill sizes take a minimum of time according to the manufacturer. A built-in diamond wheel dresser on all models provides greatest grinding accuracy and best finish to produce more holes per grinding of drill.

The model DV is powered by a ½ hp, 115/230 v, single phase, 3450 rpm totally enclosed motor. •

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Wide Face Polishing Wheel

The Murray-Way Corp., Box 180, Birmingham, Mich., designers and manufacturers of automatic polishing, buffing, grinding and filtering equipment, has announced the development of a new wide face polishing wheel.

Known as the No. 53, this new polisher with built in floating action will handle widths up to 24" and gives

an even buffing and polishing on the entire surface. It simplifies the positioning of the work piece and once the proper pressure is established hundreds of pieces can be uniformly processed.

The No. 53 cuts down the number of heads necessary to process work pieces, greatly reduces the number of passes needed to polish the work piece and gives the ultimate in positioning flexibility.

This new wide face polishing wheel is available in two models. The No. 53 Heavy-duty and the No. 54 which is ¼ smaller in size. •

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Houdaille Hershey Corp. Changes Name

Houdaille Industries, Inc., is the new name of the corporation which since 1929 has been known as the Houdaille-Hershey Corporation, it was announced today by Ralph F. Peo, president.

Stockholders of the corporation approved the change as being more descriptive of the corporation's widened scope of operations, which already were augmented earlier this year by the acquisition of Frontier Industries, Inc., of Buffalo.

Executive headquarters of the corporation recently were moved to Buffalo, where four of the company's 12 businesses are located. In addition to a wide diversity of products for the automotive, aircraft and refrigeration fields, Houdaille produces force feed lubricators, chemical feeders, tools, defense weapons, crushed stone and other construction materials.

"TUMBLING TOM" SEZ..
THERE IS NO NEED TO HURRY AND FRET,
FOR WITH A Globe YOUR NEEDS WILL BE MET,
IT TAKES THE EDGE FROM ALL THINGS ROUGH,
NO MATTER HOW FRAGILE, HEAVY OR TOUGH.

what's your finishing problem?

Let CASALBI's experimental engineering service analyze your parts finish needs. Send samples of parts and completed piece to show desired finish. CASALBI will provide detailed cost-saving finishing recommendations. Write today! No obligation, of course.

Write Dept. 33 for Tumbling Barrel Bulletin C-1

Casalbi Company

WEST GANSON & WAYNE • • JACKSON MICHIGAN

GLOBE tumbling barrels have been serving industry since 1902

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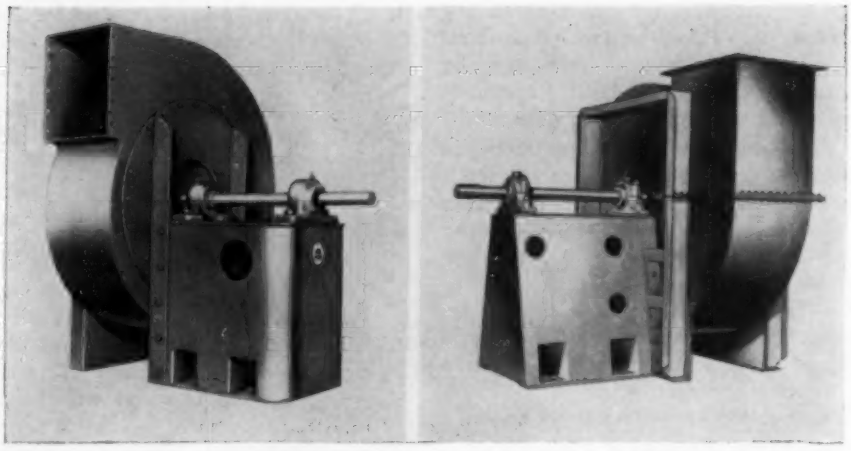

Left, standard fan available with adjustable discharge in sizes 11 through 37. Right, standard fan available with fixed discharge in sizes 41 through 60.

In nearly 500 American and foreign plants, STANDARD spindles are doing a top production job as modernizing applications on old machines, and in special adaptation for custom jobs.

GOT A TOUGH PROBLEM?
Our custom engineering department has or will get the answer for you. Tell us about it today — you'll get RESULTS that mean LOWER COST— GREATER PRODUCTION!

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Since 1912

the STANDARD electrical tool co.

PRECISION SPINDLES AND MACHINE TOOLS

2478 RIVER ROAD • CINCINNATI 4, • OHIO

ASTE EXPOSITION • CHICAGO AMPHITHEATRE • MARCH 19 thru 23

Encircle No. 251 on postpaid card

New Line of Industrial Fans Covers Full Range of Industrial Requirements

A new line of industrial fans with a new streamlined design for high efficiency is now available from American Blower Corp., Detroit 32, Mich. The new line (Figure 1) provides complete coverage of the full range of industrial requirements and features a new packaged industrial fan complete with motor, V-belt drive and running gear enclosure.

Designated series 106, the new standard industrial fans are available in sizes 11 through 37 with adjustable discharge in V-belt driven arrangements 1 and 9 for the full range, and in direct-connected arrangements 4 and 8 for limited sizes. Series 106 fan sizes 11 through 37 permit a choice of three types of wheels: AH (air handling), MH (material handling) and LS (long shavings). In sizes 41 through 60, the new units are available with fixed discharge in arrangement 1 with choice of two types of bearing supports. Series 106 fan sizes 41 through 60 can be obtained with either of two types of wheels, AH or MH.

The new series 106 packaged industrial fan, a modification of arrangement 9, is a completely self-contained unit, eliminating the need for a separate motor foundation and minimizing floor area requirement. The complete fan, motor and drive unit also simplifies installation. Packaged industrial fans are available in sizes 11 through 26 with adjustable discharge housings. MH wheels only are standard with the new packaged units; AH or LS wheels can be furnished on special order.

The complete line of series 106 units carries the certified rating seal. The new standard industrial fans in sizes 11 through 37 are available for volumes to 47,000 cfm operating with static pressures to 18 inches. These adjustable discharge sizes provide wheel diameters to 64⅜ in. and inlet diameters to 37 in. Fixed discharge units handle volumes to 125,000 cfm at static pressures to 18 inches. Sizes 41 through 60 come equipped with wheels to 104¼ in. diameter and inlets to 60 in. diameter.

Both standard designs in the new fan line are of heavy construction with provision for convenient wheel removal and easy handling in shipment and installation. Optional construction includes extra heavy housings and wheels, extra heavy shaft and bearings, special coatings, special metals and spark-resistant construction. A full line of

optional accessories, such as cooling wheel, access doors and dampers, are also available.

The fans are available for volumes to 23,000 cfm at static pressures to 10 inches. They can be obtained with wheel diameters to 45⅛ in. and inlet diameters to 26 in.

Motor, V-belt drive, shaft and bearings of the new packaged units are mounted in a heavy steel ventilated enclosure, one end of which is welded to the drive side plate supporting the housing shell. The outside end panel is made removable for easy access to the interior. The driving motor is mounted on a universal support, adjustable for belt tension, which is designed to carry standard NEMA motors. •

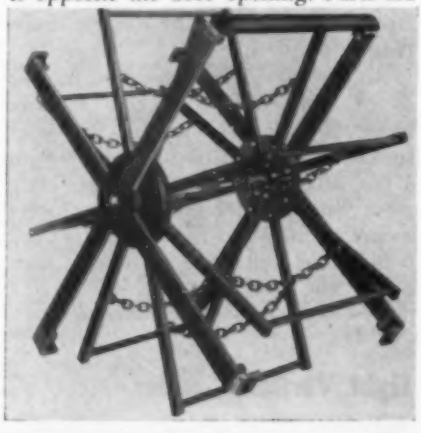
Use HANDY Postpaid Card. Encircle No. 110

Universal Rack for Barrel Tumbling

Rack tumbling in any standard barrel, is now possible with the new Lorco universal tumbling fixture, which can be ordered to fit most sizes of horizontal barrels.

Built for assembly within the compartment, the outside framework, of heavy-gage machined steel, is adjustable to insure a tight fit inside the barrel. The inner portion is a revolving ferris wheel with several work stations. Each station will accommodate one large part or several smaller parts. Rods or chains to hold parts are provided with rubber hose to prevent damage to the work parts.

To load, the rack is rotated in the drum until one of the work stations is opposite the door opening. Parts are



hung from the chains or spring-loaded rods, and the rack is revolved to the next station. When rack has been fully loaded, its ferris wheel part is clamped to the outside framework. The special clamp furnished with the rack prevents any movement while the tumbling barrel is in motion. After tumbling, the clamp is unloosened to allow the parts to be unloaded by revolving the successive work stations to the door opening. Rack is furnished with rods or chains, as required, and with special clamp.

The rack is shipped knocked down with all parts marked for quick assembly. When ordering, it is necessary for the purchaser to specify the shape of the barrel (hexagonal, octagonal, etc.), the inside length of the compartment, the inside distance from flat to flat and from corner to corner, and the inside dimensions of the door opening. Lord Chemical Corp., Dept. O, 2068 S. Queen St., York, Pa. •

Use HANDY Postpaid Card. Encircle No. 111

Porous Filler in Grinding Wheels Offers Self-Dressing

Porous filler that breaks under impact and opens up pore spaces is providing cooler-cutting action and longer life in unique new resinoid grinding wheels.

A development of Electro Refractories & Abrasives Corp., 344 Delaware Ave., Buffalo 2, N.Y., the self-dressing wheels are said to be so cool cutting, they will not affect the temper of metal being ground at high speed. Special light weight cellular glass fragments provide the new approach to pore spacing. In the past, such pores have been formed by putting naphthalene or other filler materials that evaporate in the wheel.

Wheels made with the new technique are reported to have twice the life of conventional naphthalene filled resinoid units because of the more uniform pore spaces. Pore structure controls the grinding action of any wheel. •

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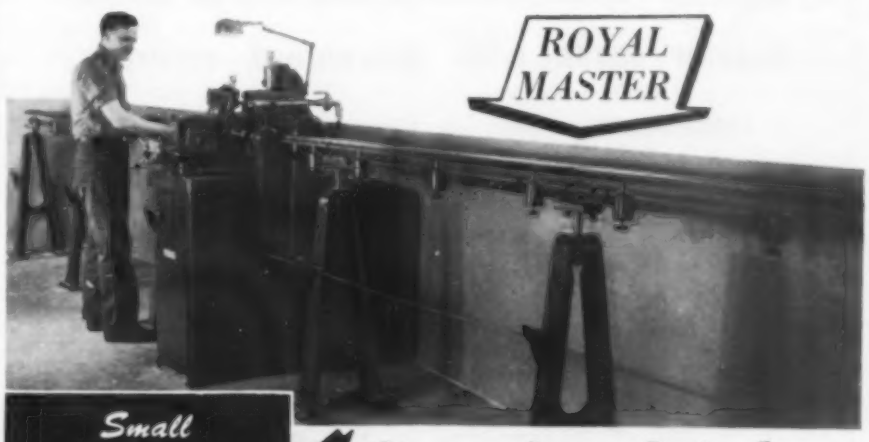

Small Compact Low Cost

For
- Carbon Steel
- Alloys
- Stainless Steel
- Tungsten Carbide
- Non Ferrous Metals
- Plastics
- Hard Rubber
- Wood
- Ceramics
- Carbon
- Fibre
- Cork
- Glass
- Etc.

The **Royal Master** is within the price reach of even the smallest machine shop, yet so efficient and versatile that it has appeal to the largest manufacturer. It saves on initial cost, maintenance, time and grinder's charges.

Write today for six-page two-color folder giving complete description of this machine.

Centerless Grinders

FOR THRUFEED GRINDING OF BAR STOCK
also for plunge and infeed grinding

Here's a Centerless Grinder for thrufeed grinding of bar stock as well as odd size dowels, drill rods, locating pins, shafts, and bushings.

This machine will handle many shapes up to 1½" in diameter and practically any shape up to 1" in diameter in infeed or plunge grinding of parts such as shouldered pins, knock out pins, taper pins, precision bolts, and multi-diameter parts.

Using the Royal Master Centerless Grinder, tolerances as low as .0002" are consistently held and 6-8 microinch finishes are easily obtained.

Close tolerance lathe work on small parts can now be eliminated by finish grinding on this machine to any accuracy required.

Many operations, for example multi-diameter and form grinding, formerly done on O. D. Grinders can be done more economically on the Royal Master.

ROYAL MASTER INC.
240 STATE HIGHWAY 23
RIVERDALE NEW JERSEY

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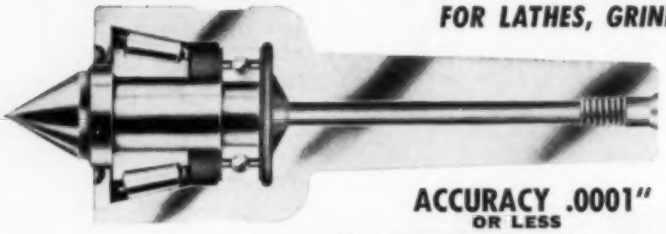
NOW BETTER GROUND FINISHES!

with J & S guaranteed* self-adjusting live centers

FOR LATHES, GRINDERS



ACCURACY .0001"
OR LESS

with PERFECTION FREE CENTERS
SPINDLE TYPE
***GUARANTEED FOR 2000 HOURS FOR ONE YEAR**

tapered Timken bearings and design accept heavier loads with guaranteed accuracy.

SIMPLE DESIGN:

Only six parts, the main body is one piece which serves as the cup for the roller bearing on which spindle turns. This permits a much greater capacity bearing in the same size body.

AUTOMATICALLY ADJUSTS FOR WEAR:

Notice the clearance behind ball bearing which allows the whole bearing assembly to move back, automatically compensating for wear on roller bearing. This maintains center's point to original concentricity.

ABSOLUTE CONCENTRICITY AND ALIGNMENT FOR BEARINGS:

Both conical and cylindrical bores of body are ground at same setting in work head. Point is ground under load in its own bearings to insure running dead true.

Design plus self-adjusting features provide accurate and chatterless grinding.

TAPERS AVAILABLE				
MORSE	JARNO	B & S	NORTON	LANDIS
2 to 7	6 to 20	7 to 18	10 to 24	.8125 1.3350 1.7500
SPECIAL POINTS, HEADS, SHANKS AND TAPERS MADE TO ORDER				

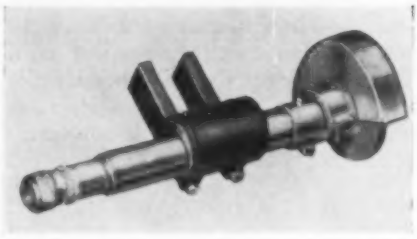
FOR INFORMATION
See your industrial distributor or write for free literature.

J&S TOOL CO. INC. — CLAMPCUT

J & S TOOL CO., INC. | **880 DORSA AVE. LIVINGSTON, NEW JERSEY**

Encircle No. 253 on postpaid card

Grinding Spindles for Flexible Shaft Machinery



This new heavy duty Wyco grinding spindle is claimed to be more convenient than a conventional tool post grinder, since the set-up is made with the spindle only and the flexible shaft motor power is not coupled on until ready to grind.

When used with a Wyco flexible shaft machine, the motor or v-belt drive cannot transmit vibration to the grinder spindle. When not in use in connection with the tool post grinder, the flexible shaft machine will quickly pay for itself doing general machine shop work.

Construction features of the grinding spindle are: welded steel double shank straddling the tool post; split eccentric sleeve adjusts for lathes from 12 to 18 inch swing; quick change socket snaps on and off; interchangeable adapter fits Wyco No. 1 & 2 and 3 to 5 shafts; removable wheel guard; grinding wheels up to 5' diameter; hardened double clamp screws for height adjustment; and 1-½" diameter quill with precision type sealed ball bearings.

No. 351-TP grinding spindle, takes grinding wheels up to 5" dia., ½" hole and 1" wide. It comes with adapter and quick change socket to fit Wyco flexible shafts Nos. 1 and 2.

No. 551-TP grinding spindle is the same as above but to fit flexible shafts Nos. 3, 4 and 5.

No. 251 is specially designed for the Wyco No. 00-UP grinder. It uses mounted grinding wheels in collet spindle or regular grinding wheels with a No. 305 wheel arbor. It comes complete with adapter and quick change socket to fit Wyco flexible shafts Nos. 0 and 01, as well as the No. 00P-M shaft of the No. 00-UP grinder. •

Use HANDY Postpaid Card. Encircle No. 113

Light Vertical Sander

A new, light-weight, high torque vertical sander designed for use with soft, resilient back-up pads and abrasive discs, has been announced by the Master Pneumatic Tool Co., Inc., of Bedford, O.

Precision Gearing, (no governor) gives the five-pound model 201 speeds of 1800 and 3200 rpm in the current model, with 4000, 5000, and 6000 rpm tools to be released in the near future.

Standard tools are equipped with a

three-step, thumb-operated throttle providing three different positive speed settings. A lever throttle handle for "feathering" finger control can be supplied as an alternate choice.

Air consumption at maximum horsepower is 31 cfm, and stall torque is 5.2 ft. lbs.

The small quiet air motor (86 decibels at 4 ft.) is contained, complete, within a cylinder body sleeve, quickly removable as a packaged unit.

Ease of dismantling makes periodic inspection and maintenance a matter of minutes.

Weight, balance and 6″ height from the bottom of the wheel collar produces high quality surface finishing on sheet metal cabinets, appliances, and automotive body panels. Operators can use it easily overhead, on vertical surfaces, or on tricky contours where smooth, flawless high-lighting is necessary. •

Use HANDY Postpaid Card. Encircle No. 114

Portable Air Grinder Features Added Power, Less Weight

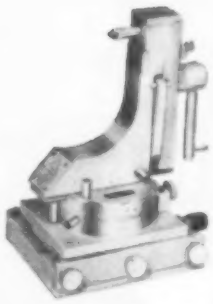
Cleco Air Tools Div. of Reed Roller Bit Co., Houston, Tex., has offered to let any factory or plant compare the new 2000 series, six-inch pneumatic cup wheel grinder to any other similar tool on that factory's air line.

The 2000 lists several design characteristics aimed at permitting the operator to do a faster, yet easier, job and to increase the grinder's useful life.

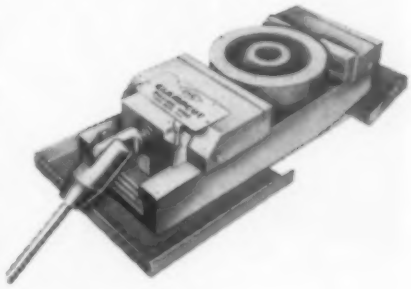
Weighing 10-½ pounds, without guard, the grinder is 7-⅜″ high, and owes most of its reduced weight to a magnesium housing and redesigned rotor.

The rotor is of ground alloy steel

J&S DOWN-HOLDING DEVICES and WHEEL DRESSERS LEAD THE FIELD

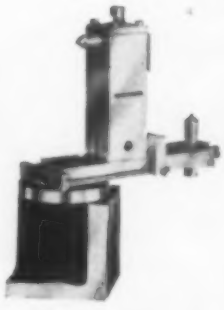


Fluidmotion Wheel Dressers—Dress two angles tangent to a radius, using ONE handle in one continuous motion. Operation is so fast and simple that beginners can use them. For all types cylindrical and surface grinders.



J & S Swivel Vise—The only hardened and ground swivel vise that mounts low, swivels, needs no pedestal. Patented down-holding clamping jaws give many times the holding power of an ordinary vise, yet only half the weight.

J & S All-Purpose Jaw Clamps — For any machine table or face plate. Five models—one adjusting screw has a holding force of 2½ tons on Small model, 12 tons on Jumbo model. Eliminate u-clamps, straps and fingers. No obstruction problems, no interference with measuring tool readings.



J & S Form-Master—Sturdy wheel dresser for shops with less frequent wheel dresser requirements. High quality, 100% dust-proof, it is capable of dressing any radii up to 12″ convex, up to 15″ concave. Prices start at $45.00.

WRITE FOR INFORMATION ON THE NEW J&S PURCHASE PLAN

Write for free literature and further information.

J&S TOOL CO. INC. — CLAMPCUT

J & S TOOL CO., INC.

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GRIND WITH RED-E PRECISION ANTI-FRICTION CENTERS

• Eliminate down time changing wheels, diamonds and coolants—have micro finish, *always!* Only RED-E Precision ABEC-7 Spec. angular contact, preloaded, locked-in-bearings have the ability to support the radial and thrust capacities demanded of modern grinding applications.

TWO TYPES FOR YOUR NEEDS	TAPERS AVAILABLE				
	Morse	B&S	Jarno	Norton	Landis
SHANK TYPE	1 to 6	5 to 15	4 to 20	10 to 16	.8125, 1.335, 1.750
SPINDLE TYPE	2 to 7	7 to 18	6 to 20	10 to 24	.8125, 1.335, 1.750
	Special heads, tapers, shanks and points made to order.				

Your RED-E Industrial Distributor has the "know how" to solve your grinding problems—ASK him *now* for the new RED-E Catalog No. G550-1. It's all you need!

RED-E-TOOLS READY TOOL COMPANY
566 Iranistan Ave. • Bridgeport 5, Conn.

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floating on the shaft, eliminating assembly of the motor unit. The cylinder is of high carbon steel with smooth inside surfaces to reduce friction and wear. The air port leads under the rotor blades for quick and positive starting.

Sealed ball bearings, fixed in the front bearing plate and securely held on the rear shaft, permit a high axial thrust loading.

The Cleco grinder has a large capacity filter screen for the air passage leading over an automatic oiler and oil chamber providing positive lubrication for moving parts, including rotor blades. A leakproof valve system is of a simple type design coupled with an "O" ring.

The governor, with its separate oiler, has a ball type center. It is adjusted through a rotor shaft hole, eliminating the necessity of taking off covers or disassembling the grinder. The shaft hole, fitted only by a special wrench, is closed by a countersunk Bristol screw after adjustment has been made.

For operator convenience, the grinder has a three-position dead handle. The snap handle is controlled by the operator's finger tip, and can be worked easily while the operator maintains a solid grip.

The snap handle is interchangeable with a wing nut throttle, and can be alternated without removing the grinder's handle. Only one casing is used.

The 2000 grinder can use either the straight type abrasive wheel with the guard attached to the grinder body, or the flanged cup abrasive wheel with the revolving cup guard. The grinder-attached guard is removable without affecting the motor assembly.

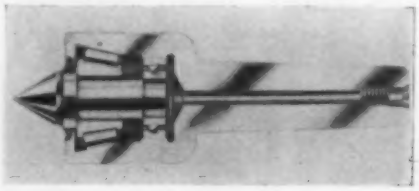
The grinder also has two keys for balancing and torque transmission, and through-bolts for compactness and rigidity. Noise level has been reduced by a silencer insert. •

Use HANDY Postpaid Card. Encircle No. 115

Self-Adjusting Live Center for Lathes and Grinders

J & S Tool Co., Inc., 87 Dorsa Ave., Livingston, N.J., has announced control of manufacturing and distribution of the perfection free center, which has been in production by J & S Tool Co., Inc., for the past four years.

The manufacturer claims this center is the only guaranteed self-adjusting live center on the market. For Lathes and Grinding machines, these perfec-



tion free centers feature tapered timken roller bearings and a design which allows heavier loads with guaranteed accuracy of .0001" or less, because of the heavy and comparatively short spindle which minimizes deflection and increases bearing life.

Simple in design, with only six parts, the main body of the center, all in one piece, serves as the cup for the roller bearing on which the spindle turns. Thus the end thrust from the work keeps the tapered roller bearing perfectly seated, automatically adjusting for wear and maintaining accuracy.

To insure concentricity and absolute alignment for the bearings, both conical and cylindrical bores of the body are ground at the same setting. To eliminate any possible runout of the point it is ground under load in its own bearings; consequently it runs dead true.

They can be furnished to meet requirements to any capacity up to the limit of tapered roller bearings and are guaranteed for one year or 2,000 hours of operation. •

Use HANDY Postpaid Card. Encircle No. 116

New Resinoid Grinding Wheel Bond

In its new B11 resinoid bond, Norton Co., Worcester 6, Mass., has announced a significant step in the direction of greater uniformity of resinoid bonded grinding wheels from lot to lot. This new bond, used in conjunction with new molding and firing techniques, insures a more uniform structure than has been possible in resinoid wheels previously.

Increased uniformity of structure or spacing of abrasive grains throughout the wheel is reflected in all-around improved performance. Specifically, this means more accurate and uniform work, improved surface finish, reduced diamond truing tool costs as well as lower unit grinding costs.

With the increasing use of automated equipment, uniformity of grinding wheels from lot to lot is of prime importance. Changes in the automatic cycle need not be made to compensate for variations in grinding action. Even in manually operated equipment, the benefits of increased uniformity are important.

Resinoid wheels with the new B11 bond are available in a wide range of hardness grades and sizes. They have been tested successfully on almost all types of work using resinoid bonded wheels. Specifically, these wheels have been successfully applied to centerless, cam, roll, disc, and thread grinding operations in addition to snagging and surfacing. •

Use HANDY Postpaid Card. Encircle No. 117

REPRINTS AVAILABLE

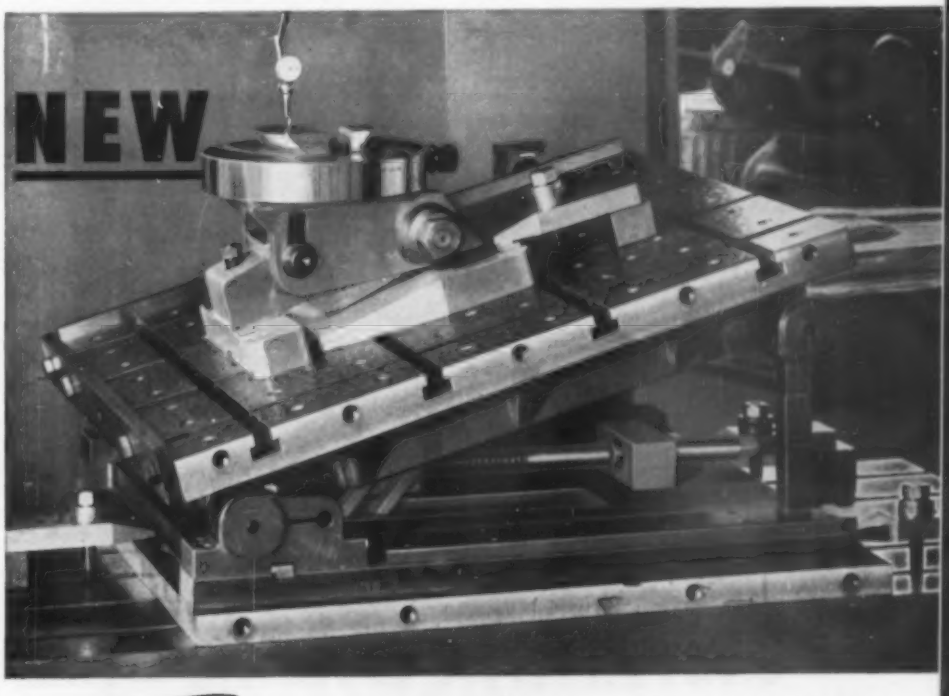
A few reprints of articles which have appeared in previous issues of GRINDING and FINISHING are available:

Abrasive Grains, by Joseph J. Forrester.

What Is the Smallest Radius That Can Be Dressed with a Wheel Dresser? By Henry F. Swenson.

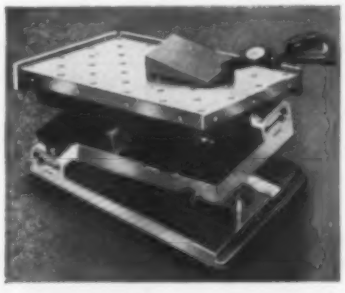
Where and How You Can Use Abrasive Rolls, by Robert McAdams and James L. Erickson.

Available at no charge from GRINDING and FINISHING, 222 E. Willow Ave., Wheaton, Ill.



Robbins **SINE PLATE**

WITH 24" x 24" WORKING AREA



Smaller Sine Plates are also available in models for both single and compound angles. Thousands are in daily use. Full details are in our illustrated catalog. Send for your free copy.

Designed on the sine bar principle, this husky new addition to the Robbins Sine Plate family provides gauge-block accuracy to angular set ups for very large, bulky work pieces. Any angle is quickly and accurately set up by inserting the correct standard gauge blocks between the top plate and the base of the unit.

In addition to the sturdy construction of these units, and to eliminate any possibility of dimensional inaccuracies due to distortion, gauge blocks are inserted at each side of the Sine Plate. Top plate is raised and lowered by a simple screw-type mechanism . . . positioning is simple, safe, sure.

Two of these Sine Plates used in combination also answer the need for any compound angle.

Complete information on these new extra-large Sine Plates or models built to specifications will gladly be forwarded upon your request.

OMER E. Robbins COMPANY

24800 PLYMOUTH ROAD • DEPT. H-4 • DETROIT 39, MICH.

Also producers of special gauges and fixtures

Lee R. English

C. F. Wills

W. S. Hoskin

John F. Crowell

George E. Shoup

Promotions & Appointments

Lee R. English, industrial account executive with the Ohio Advertising Agency of Cleveland, last week was named sales manager of the Cleveland Tool & Die Co. and the Cleveland Grinding Machine Co.

His position as sales manager for the two Cleveland firms will involve developing a new sales promotion program for the Visual Grind, a new surface grinding machine which provides continuous inspection of precision work in progress by magnification through a built-in "comparator" optical system.

The Dumore Co. of Racine, Wis., has announced the appointment of **George E. Shoup** as executive vice-president. The announcement was made by Robert L. Hamilton, president of the firm, as a result of action taken during the recent fall meeting of the board of directors.

C. H. (Fid) Wills has stepped into a newly-created vice-presidency and **W. S. (Red) Hoskin** has become the new general sales manager of Michigan Abrasive Co., 11900 E. 8-Mile Rd., Detroit.

"Wills, after completing a highly successful period as vice president in charge of sales, was the natural one to turn to when our board approved a long-term concentrated program for developing new products and new adaptations for present products," **Max C. Jones,** Michigan Abrasive president, explained in making the announcement.

"Hoskin, who has been in the abrasive field since 1934 and has been our leading sales representative for years, was our natural choice to take over as general sales manager in charge of all sales."

John F. Crowell has been appointed sales manager of the "Centra-Point" Division of William H. Field Co., Inc. Boston. The division has been formed to manufacture and sell the firm's new end mill grinder.

Donald L. Price

The appointment of four sales managers has been announced by Ralph M. Johnson, vice president in charge of sales of the Abrasive Div., of Norton Co. The move, designed to consolidate each product line under a single head, becomes effective December 1.

Donald L. Price becomes sales manager, Grinding Wheels; **George A. Park,** sales manager, Abrasives; **Harlan T. Pierpont,** sales manager, Refractories; and **Fred L. Curtis,** sales manager, New Products.

The H. W. Leighton Co., Peninsular grinding wheel distributors located at 565 West Washington Ave., Chicago, Ill., has announced the appointment of **A. J. Zocalli** as sales engineer. Mr. Zocalli brings to his new position long experience as machine operator, abrasive field engineer and grinding wheel representative for large, well-known manufacturers. He is well qualified in precision grinding, especially in the fields of honing and super-finishing.

The ESBEC Barrel Finishing Corp. of Byram, Conn., has announced the appointment of **E. W. Denny,** Denn-Burr Process Co., 8833 Philbin St., Arlington, Calif., as its representative in Southern California.

Mr. Denny, formerly a development engineer for General Electric Co., has put in local stocks of ESBEC color identified barrel finishing compounds so as to give Southern California industry the fastest possible service on the popular products.

George A. Park

Fred L. Curtis

DUST

COLLECT IT WITH Hammond DUSKOLECTORS

CYCLONE

FILTER

Your plant produces dust in a surprising number of locations. By collecting it at the source you:

- Provide healthier working conditions
- Protect costly machines
- Reduce cleaning and painting costs

Hammond Duskolectors don't cost—they pay!

Clip this page to your letterhead. Duskolector catalog with helpful engineering information and interesting installation views will be sent at once.

Hammond Machinery Builders INC.

1651 DOUGLAS AVENUE • KALAMAZOO, MICHIGAN

Encircle No. 257 on postpaid card

Bay State Abrasive Products Co., Westboro, recently announced the retirement of **Leonard M. Krull** from the company's executive committee. It is announced that effective early in 1956 he will retire from all further active management of the company. He will, however, retain his position as Chairman of the board of directors. Since the founding of the Westboro company in 1922, he has been its treasurer.

The appointment of **Henry Risko** as sales manager of the Industrial Filtration Div., has been announced by the U.S. Hoffman Machinery Corp., New York.

Risko joined U.S. Hoffman in 1942 as a service engineer in the Industrial Filtration Div., and in 1952, was appointed Division service manager. In his new capacity, Risko will be in charge of sales for the Filtration Div., which manufactures flotation units, precoat type pressure filters, disc filters, magnetic separators, petroleum solvent stills, suction filters, and other specialized equipment.

Warren C. Olson has been elected executive vice-president by the board of directors of the Besly-Welles Corporation, Beloit, Wisconsin.

At the same election, **E. Kenneth Welles, Jr.** was named secretary of the company, filling the vacancy left by Mr. Olson's promotion from secretary to executive vice-president. Welles will continue as advertising and sales promotion manager of the firm in addition to his new duties as secretary.

The Besly-Welles Corporation has appointed Austin Ford Logan, Inc. of Buffalo, New York, as a stocking distributor of the Besly Tap line.

Leonard M. Krull

J. H. McVay, formerly with the Navy's bureau of ordnance, Washington, has joined the diamond project section of General Electric's Carboloy Department, Detroit.

While with the Navy, McVay carried out research and development work on heavy naval guns. One of his more recent developments, a water-cooled barrel for anti-aircraft work, has been accepted as a standard in this country, and now is being adopted by the British.

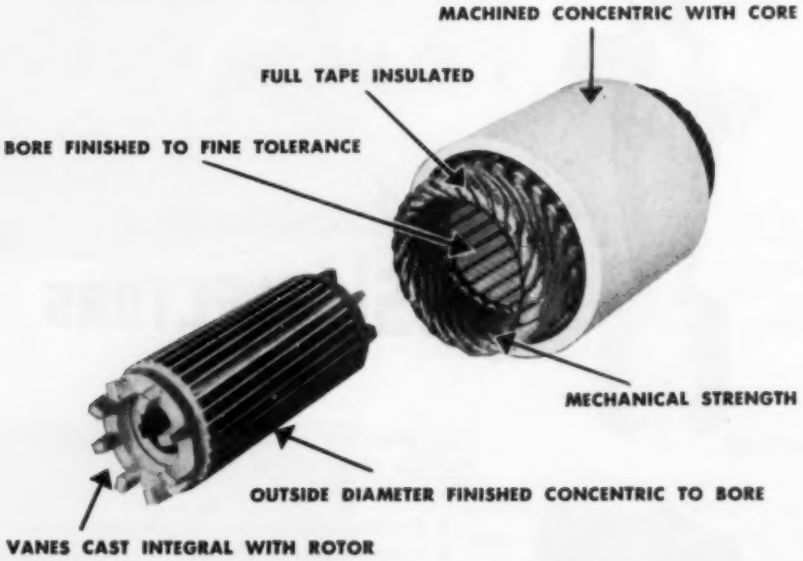
Herbert H. Lett, formerly public relations manager and assistant to the manager of industrial relations of Canadian Carborundum, has been appointed technical editor of the public relations branch of The Carborundum Co.

As technical editor, Lett will supervise the preparation and publication of technical articles, servicing all divisions and subsidiaries of the Company in the United States and Canada.

Henry Risko

Serving the Industry Since 1852

WOODS SHAFTLESS MOTORS


MACHINED CONCENTRIC WITH CORE
FULL TAPE INSULATED
BORE FINISHED TO FINE TOLERANCE
MECHANICAL STRENGTH
OUTSIDE DIAMETER FINISHED CONCENTRIC TO BORE
VANES CAST INTEGRAL WITH ROTOR

The application of direct motor drive with WOODS' Shaftless Motors to high-speed spindles brings the peak of motive efficiency at relatively small cost. Conserves space—eliminates belts and gears—fewer wearing parts. The extensive and varied lines of WOODS' Shaftless Motors are available for nearly every class of direct application.

Let us tell you how you can achieve a reduction in production costs by direct motor drive.

MOTOR DIVISION

S. A. WOODS MACHINE CO.
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Electro Refractories Purchases Interest in Spar-Mica

Electro Refractories & Abrasives Corp., of Buffalo, N. Y., has purchased a substantial interest in Spar-Mica Corp. of Montreal, Canada, as a diversification move into the field of ceramic and other non-metallic minerals, Grant S. Diamond, Electro president, reported to stockholders recently.

A total investment of near $1,390,000 has been made by Electro, a leading manufacturer of crucibles, refractories and grinding wheels, Mr. Diamond said. For a 40 per cent interest in Spar-Mica, Electro paid $333,500 and 10,000 shares of Electro common, valued for the purpose at $166,500.

However, the company advanced an additional $888,888 toward development of two large deposits of feldspar and mica located on tide water in the St. Lawrence River and Gulf of St. Lawrence areas. Strategic Materials Corp. and its subsidiary, Stratmat Ltd., have provided $1,111,111 for the facilities expansion and working capital.

Electro has signed a long-term contract to manage Spar-Mica and Golding-Keene Co. of Keene, N. H., Spar-Mica subsidiary. Mr. Diamond, president of Spar-Mica since its formation in 1953, will act as chief executive officer of both Spar-Mica and Golding-Keene.

Canadian operations will revolve around an economic new feldspar processing method developed by Mr. Diamond. It is said to yield greater glass spar concentrate than existing upgrading methods.

Electro is borrowing $375,000 from the John Hancock Mutual Life Insurance Co. and its subsidiary, Electro Refractories & Abrasives Canada, Ltd., is obtaining $300,000 from the Royal Bank of Canada to help finance the investment.

Three Electro directors, Carl F. Leitten, executive vice president; Eugene D. Cowlin and Oliver A. Weppner, have been elected directors of both Spar-Mica and Golding-Keene.

In a special report to Electro stockholders, Mr. Diamond pointed out the company is well acquainted with customers in the ceramics industry and their processes and raw materials, one of the most important of which is feldspar. He said this knowledge, coupled with Electro's proven managerial ability, will provide additional earnings.

Accessibility of the feldspar and mica deposits to bulk shipping are expected to be a major advantage in Spar-Mica operations. Ships will be able to carry such cargoes to eastern United States and Great Lakes ports.

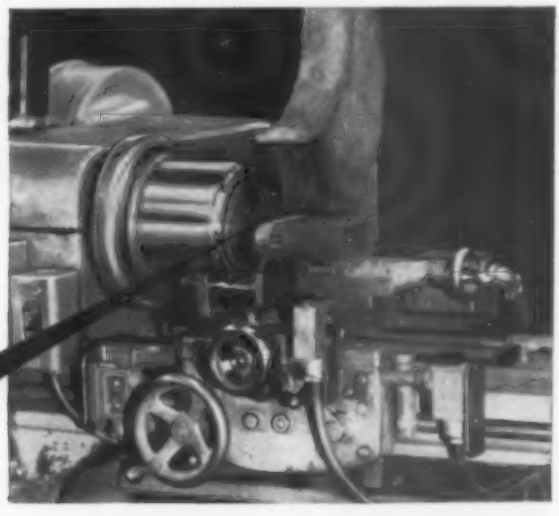
One deposit, with tremendous pegmatite dikes high in potash feldspar content, is at Baie Johan Beetz, Que., on the north shore of the Gulf of St. Lawrence. The other, rich in feldspar and muscovite mica, is in Bergeronne Township near the confluence of the St. Lawrence and Saguenay Rivers.

The Johan Beetz facilities are not expected to be in operation until next year. However, these operations should reach capacity in 1957, Mr. Diamond added. •

Dr. Wingate A. Lambertson, formerly assistant director and professor of silicate chemistry of the Institute of Silicate Research for the University of Toledo, has been appointed assistant to the manager, Research Branch of the Research and Development Div., of the Carborundum Co., according to an announcement by Harry C. Martin, vice president in charge of the Division.

Dr. Lambertson, with a broad background in the field of refractories, high temperature chemistry, and ceramic materials for nuclear reactors, will be responsible to expedite the flow of information on Carborundum laboratory developments to potential customers with emphasis on military and atomic energy applications of ceramic materials.

Magna-Lock Magnetic Chuck at Wabash Division, Raybestos-Manhattan, Inc.



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Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

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Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

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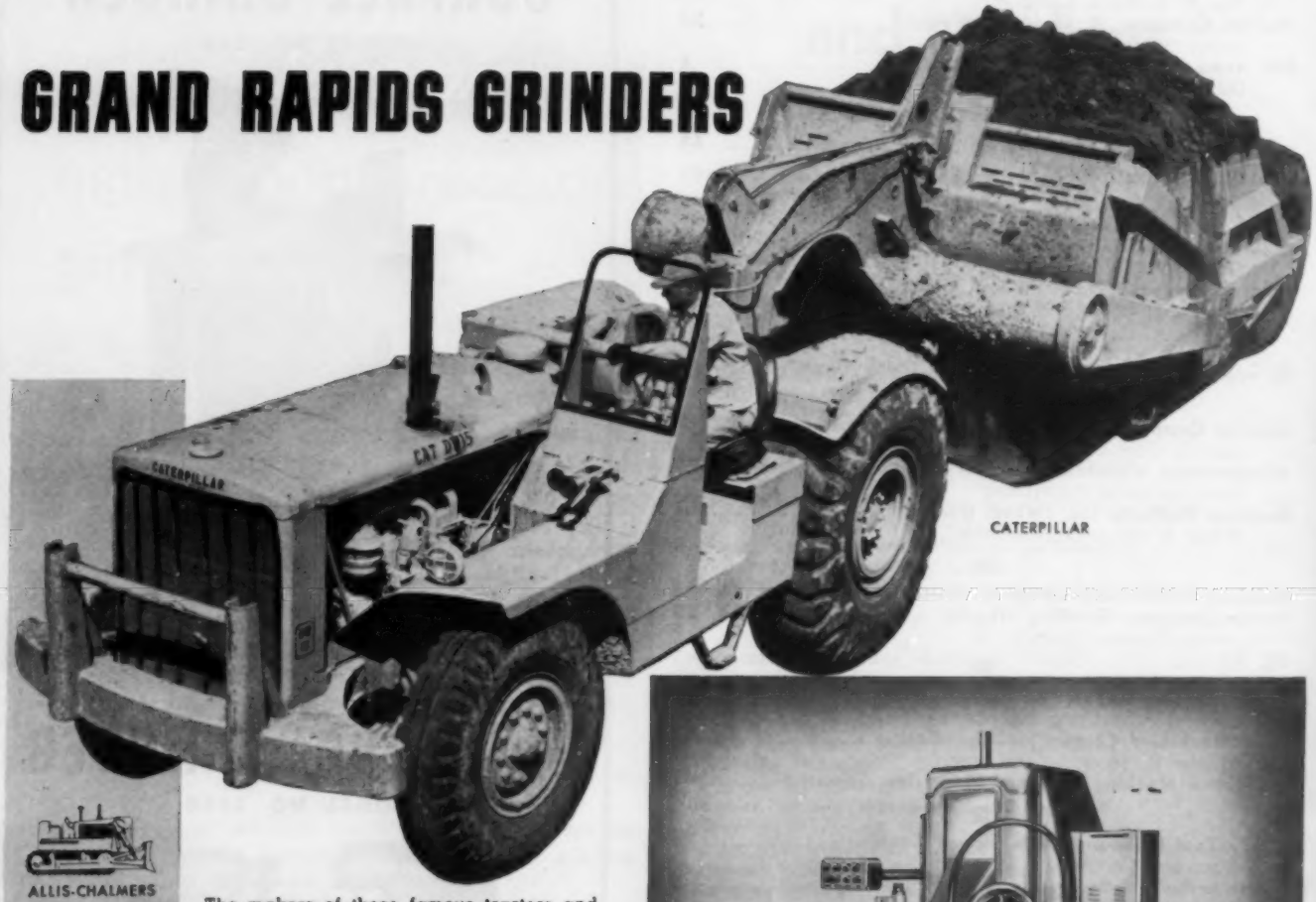

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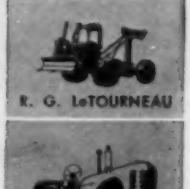

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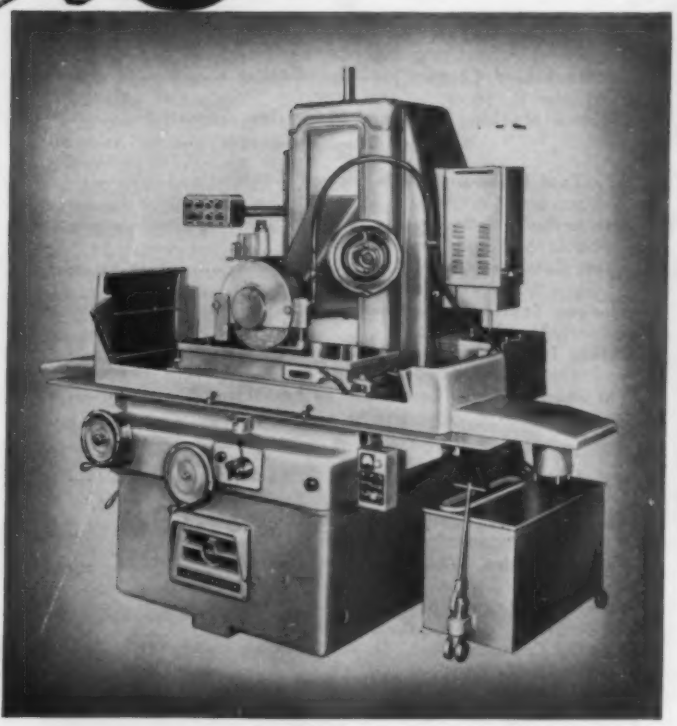
If you're not already enjoying these standout features in your toolroom, a note on your letterhead will bring full details.



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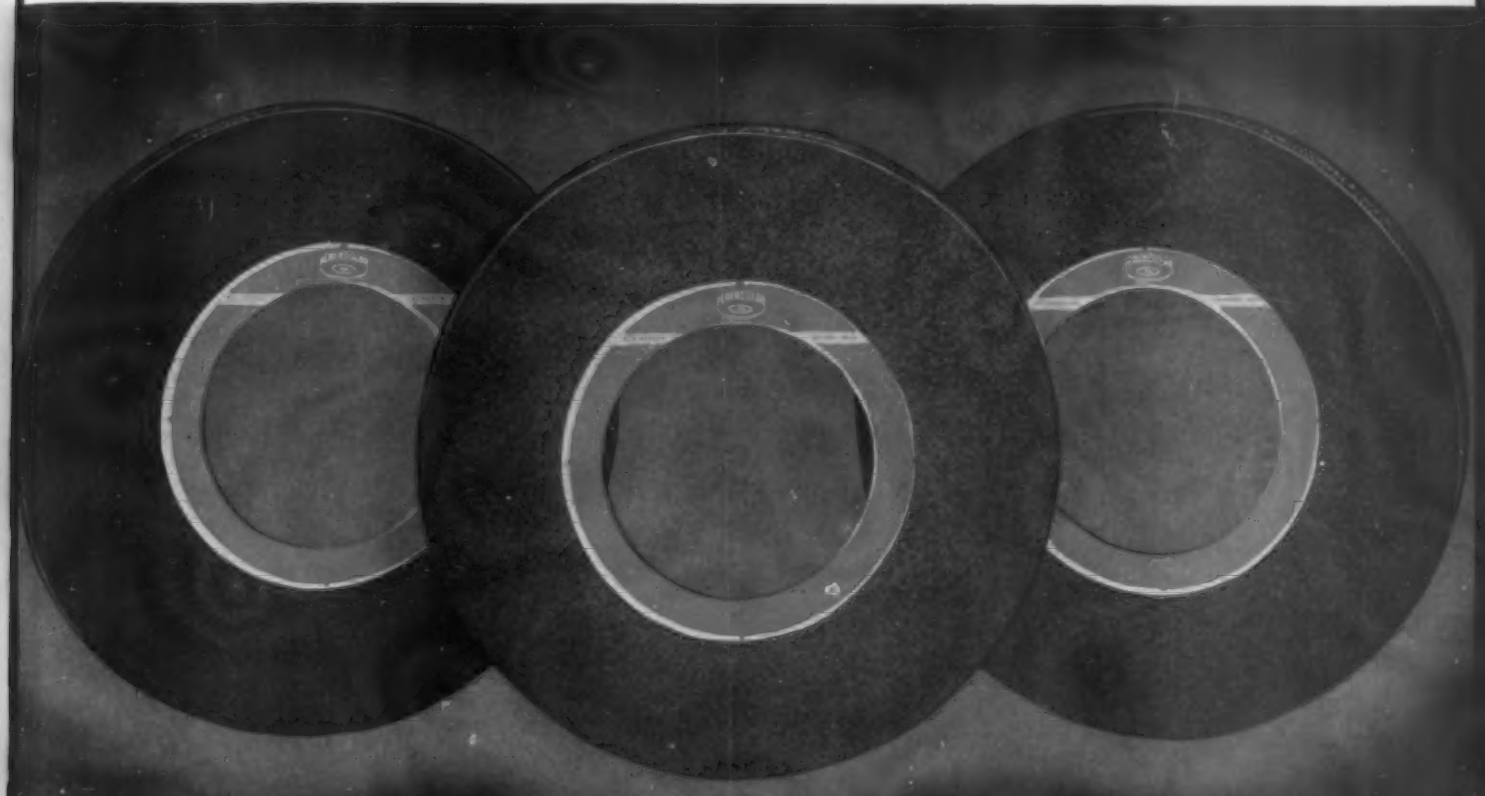

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